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CMOS 16-BIT SINGLE CHIP MICROCOMPUTER

S5U1C17801T1100

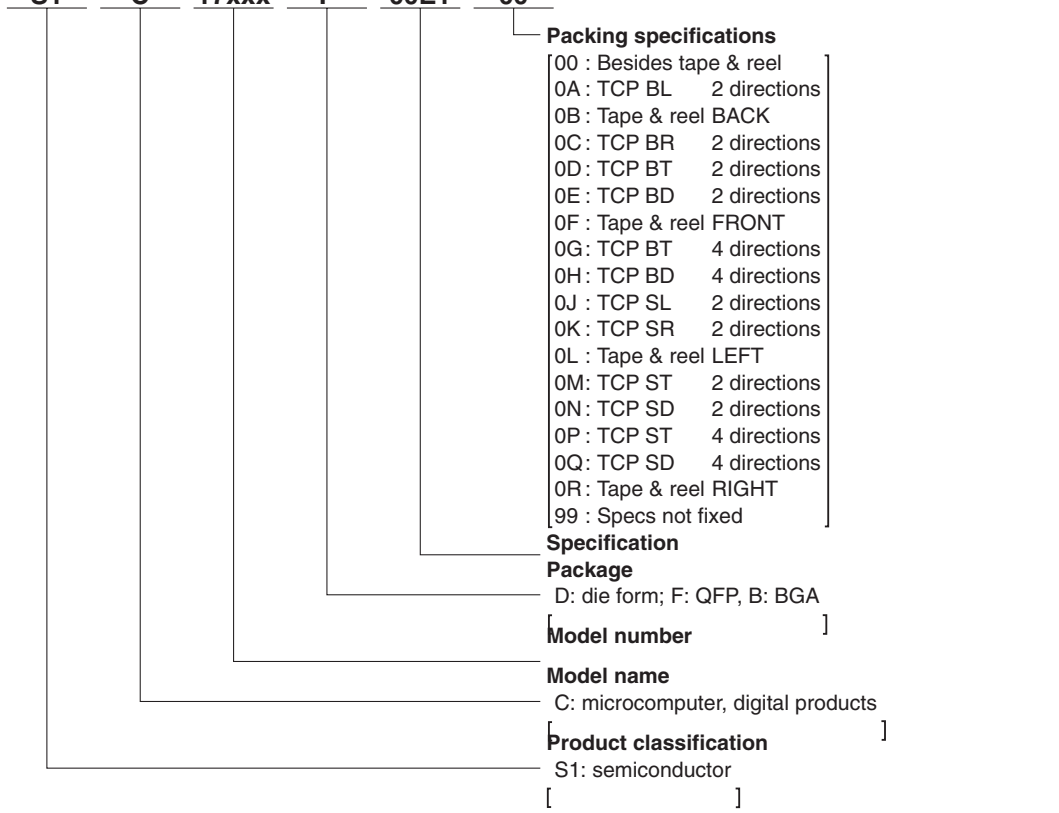
Hardware Manual

(Software Evaluation Tool for S1C17801)

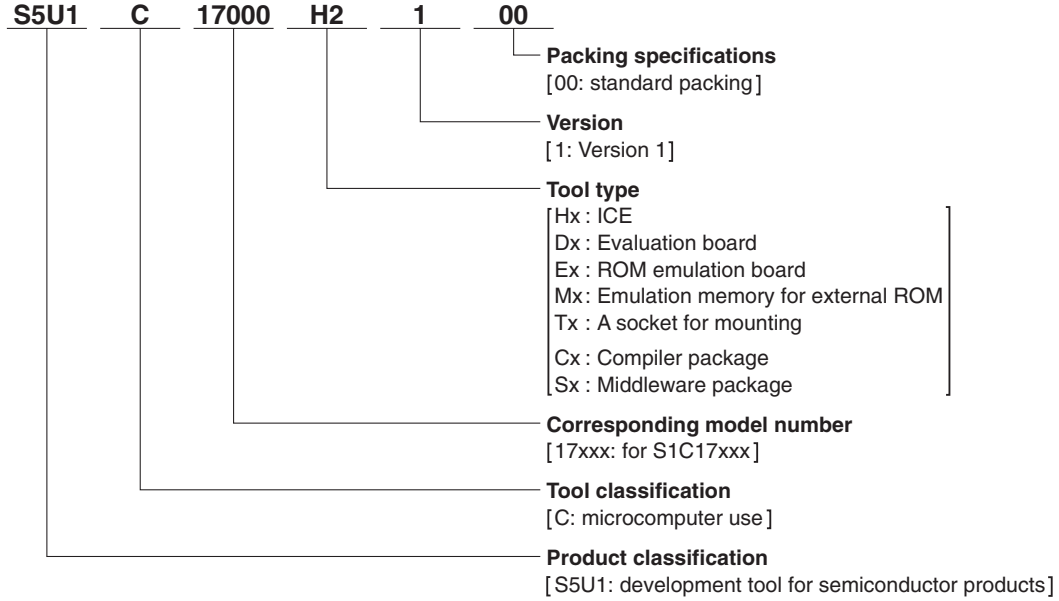
SEIKO EPSON CORPORATION

Configuration of product number

Devices



Development tools



- Table of Contents -

1 Features

S5U1C17801T1100 (Software eValuation Tool for S1C17801. Hereafter referred to as SVT17801)is an evaluation board for MCU S1C17801 manufactured by SEIKO EPSON.
The SVT17801, consisting of the three boards, i.e., CPU, ICD and LCD, can debug software by connecting to the ICD and CPU boards without using ICD or other debug tool. By connecting to the CPU and LCD boards, the SVT17801 can also be used for simple evaluation of LCD panel display.
In addition, serial port, AD input port, and other expansion interfaces built in the SVT17801 allow customer's original expansion boards to connect with the SVT17801.

〈CPU Board〉

CPU	S1C17801
Input power voltage	+5.0V (DC)
Regulator output voltage	+3.3V
CPU Input Clock	OSC1:32.768kHz
	OSC3:48MHz
Built-in Functions/Devices	- Reset switch
	- Expansion interface connectors (LCD, GPIO, UART, I²C, AD)
	- ICD board connector
	• SRAM (16Mbit)
	• NOR Flash (64Mbit)
	• NAND Flash (2Gbit)
	• EEPROM (256Kbit)
	- Battery backup control circuit/Power switch
	- Key input circuit (6 keys)
	- Rotary encoder with switch
	- Status display LED (tri-color LED/mono-color LED x 2)
	- Infrared LED/Receiver module
	- AudioCodec
	- USB miniB type connector
	- MMC card socket

〈ICD Board〉

Interface with PC	USB 1.1
Supply voltage	USB bus power (On-board regulator output voltage of 3.3V)
Built-in Functions/Devices	- Status display LED (tri-color)
	- Reset switch
	- CPU board connector

〈LCD board〉

LCD panel module	3.5 inch STN QVGA 320 x 240 dots B&W panel
	Membrane type touch panel

2 Contents of Package

The following lists the contents of S5U1C17801T1100 package:

(1) SVT17801 CPU Board (Main body) 1
(2) SVT17801 ICD Board 1
(3) SVT17801 LCD Board 1
(4) USB Cable 1
(5) Coin Battery (CR2032/3V) 1
(6) AC Adapter 1
(7) Warranty Registration Card ..... 1 each for English/Japanese
(8) Warranty Card ..... 1 each for English/Japanese
(9) Precautions in Use ..... 1 each for English/Japanese
(10) Manual Download Guide ..... 1 each for English/Japanese

3 Name and Functions of Each Part

Name of Each Part

The following describes name and functions of each part:

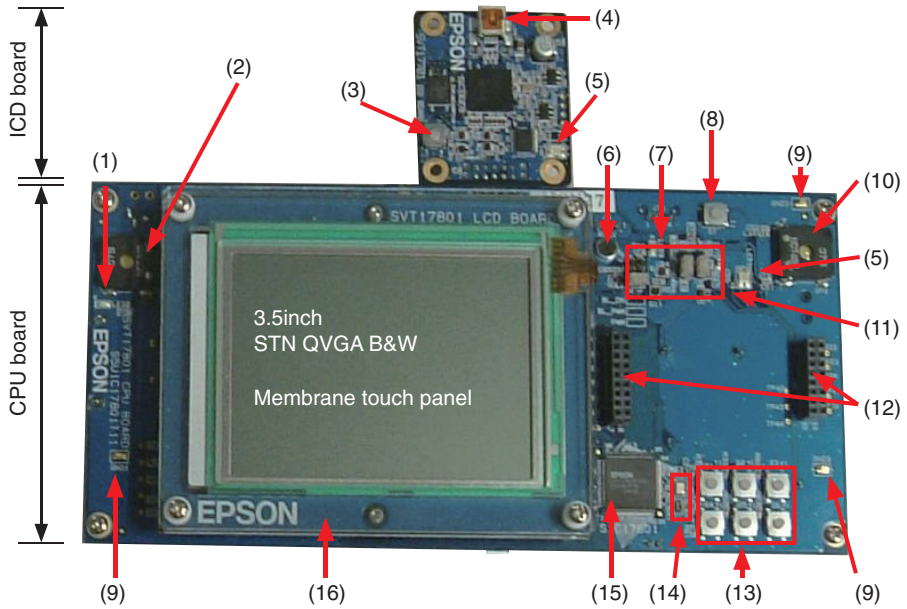


Fig. 3.1.1 Name of Each Surface Mounted Part (with LCD Panel)

(1) Power LED (Blue)
(2) Speaker (Left)
(3) RESET SW
(4) USBminiB connector
(5) LED (RGB)
(6) MIC
(7) LED
(8) POWER SW
(9) GND pin
(10) Speaker (Right)
(11) JP pin
(12) Expansion connector
(13) Key switch
(14) Crystal oscillator (48MHz/32KHz)
(15) S1C17801
(16) LCD board

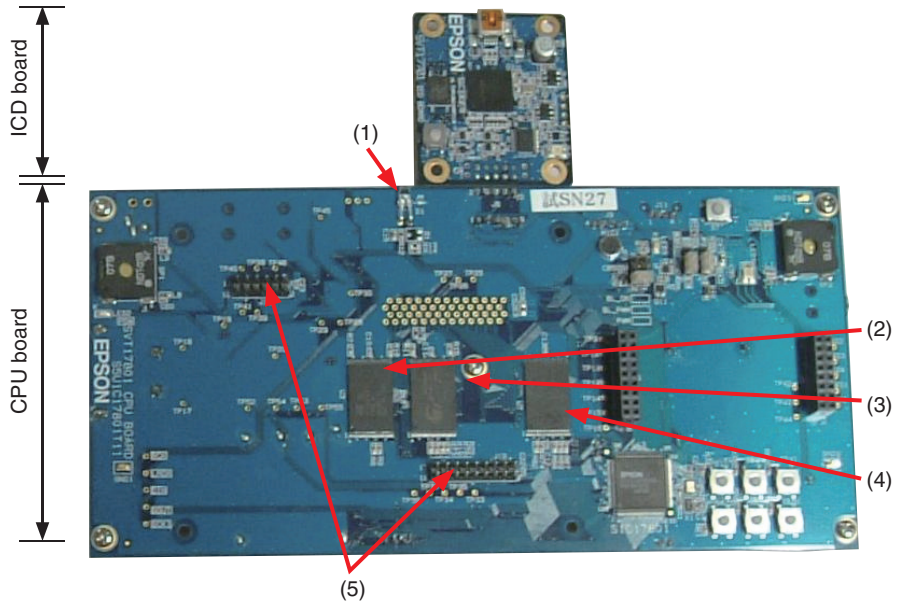


Fig. 3.1.2 Name of Each Surface Mounted Part (without LCD Panel)

(1) Infrared emitting module LED
(2) FLASH (NOR)
(3) SRAM
(4) FLASH (NAND)
(5) Expansion connector (LCD board)

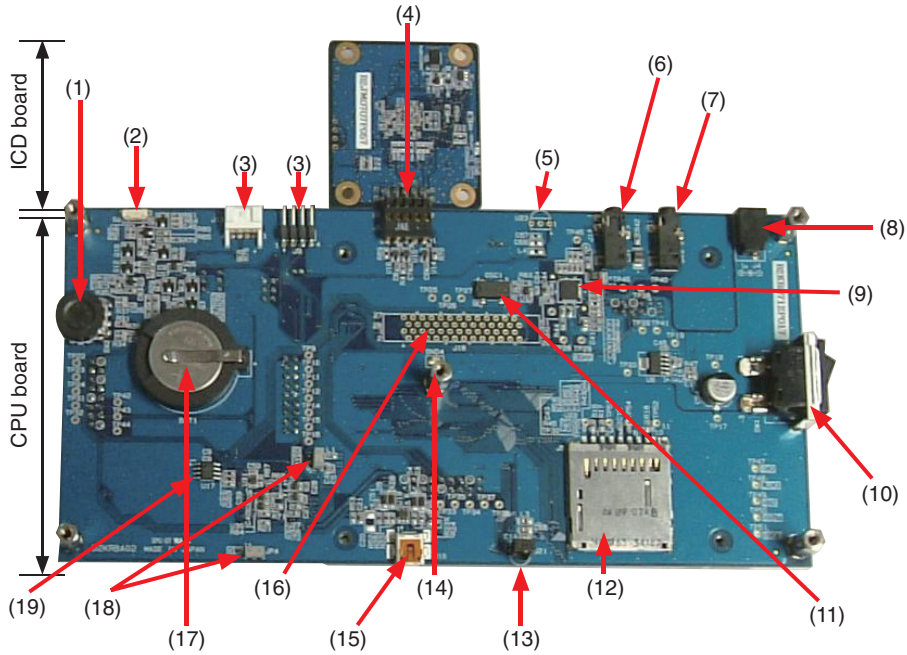


Fig. 3.1.3 Name of Each Rear Face Mounted Part

(1) Rotary encoder with Switch
(2) RESET SW
(3) ICDminiI/F
(4) ICD board connector
(5) Placement of infrared receiver module (substitute)
(6) Audio connector (OUT)
(7) Audio connector (IN)
(8) Power supply connector (5V)
(9) AudioCodec
(10) Power Switch
(11) AudioCodec Oscillator
(12) MMC Card Socket
(13) Infrared receiver module
(14) GND pin
(15) USBminiB connector
(16) Bus connector (Not available)
(17) Coin Battery
(18) Measuring JP for IC consumed current
(19) EEPROM

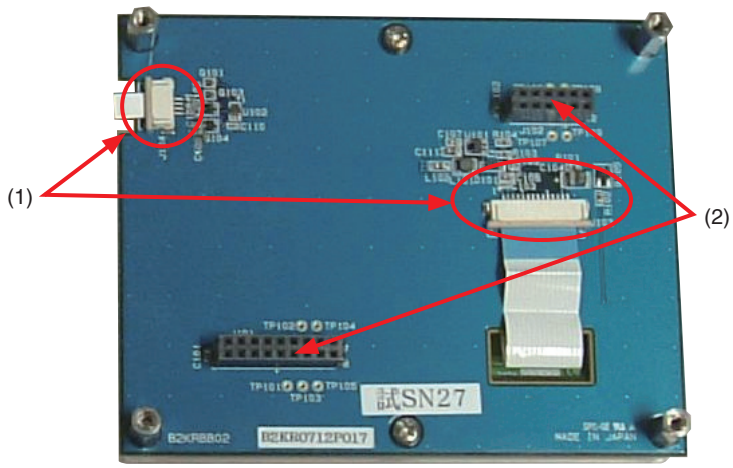


Fig. 3.1.4 Name of Each Part Mounted on Rear Face of LCD Board

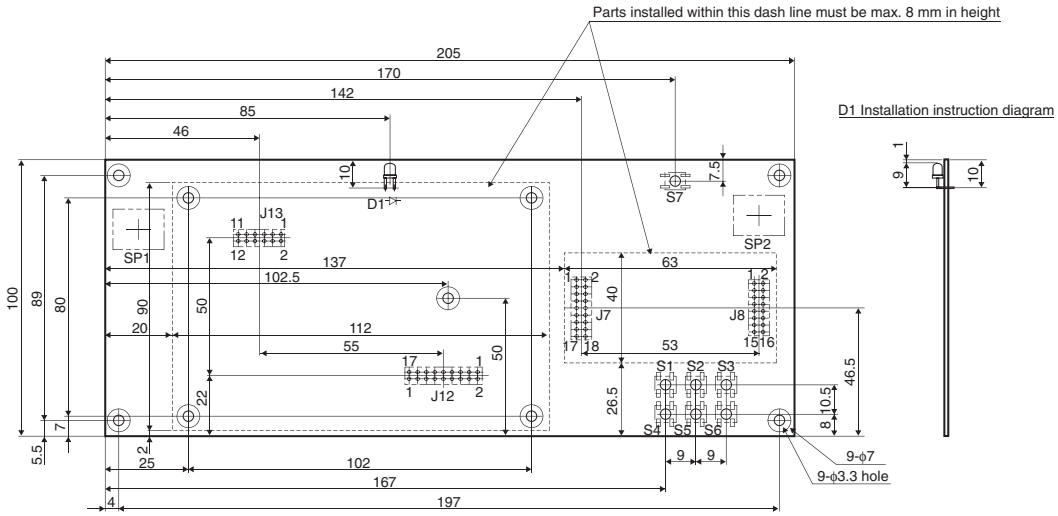
(1) Connector (to connect LCD panel)
(2) Connector (to connect CPU board)

Board Dimensions

CPU Board Dimensions

The following drawing shows dimensions of the CPU board.

<Surface>



<Rear Face>

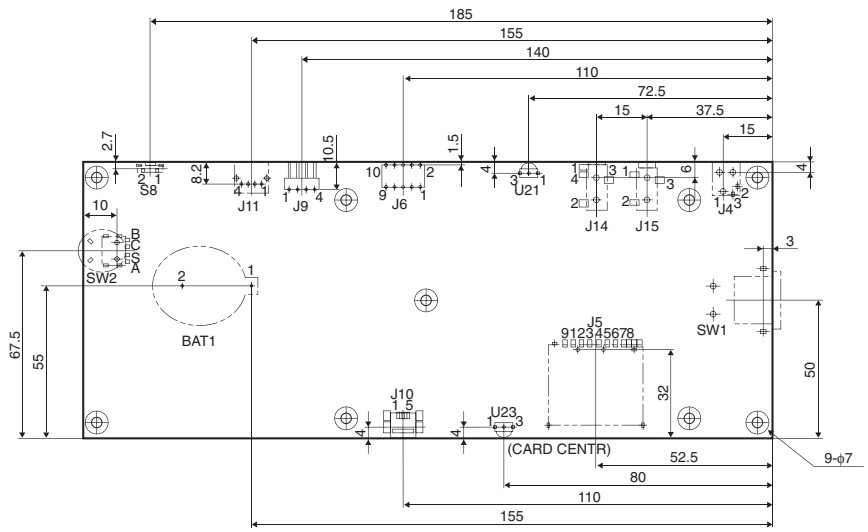


Fig. 3.2.1.1 CPU Board Dimensions

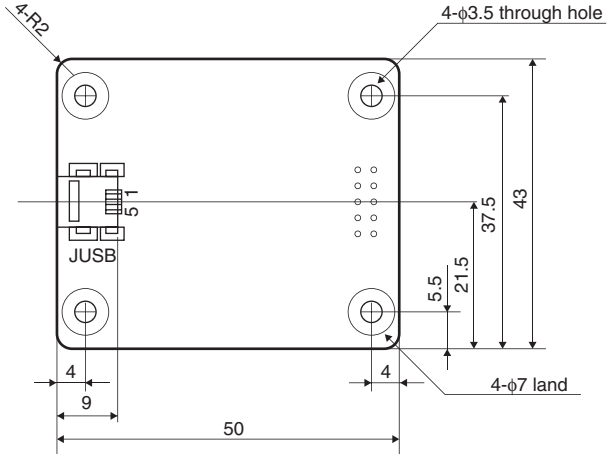
∗ **Precautions**

- **Unit for the above dimensions is millimeter (mm).**
- **Board thickness: 1.6 mm, U23 is not mounted.**

ICD Board Dimensions

The following drawing shows dimensions of the ICD board.

<Parts Side View>



<Soldering Side View>

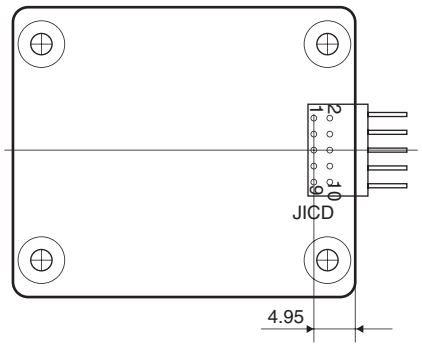


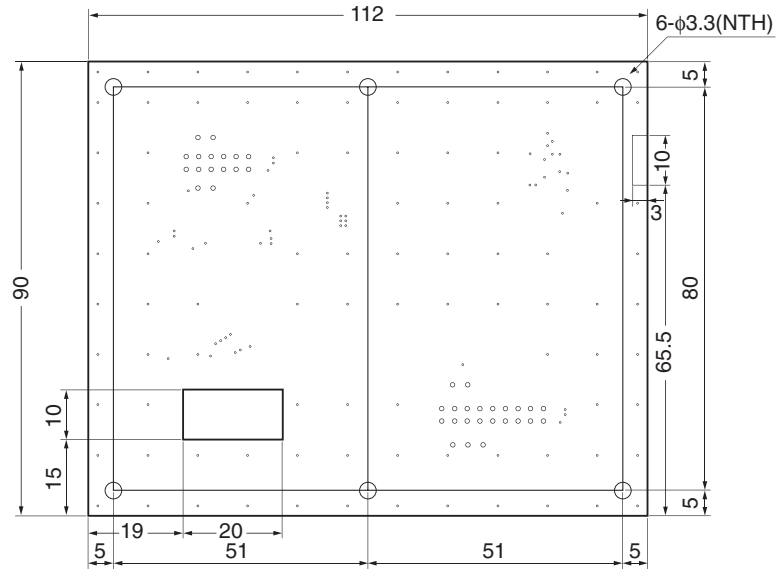
Fig. 3.2.2.1 ICD Board Dimensions

∗ Precautions
- Unit for the above dimensions is millimeter (mm).
- Material: FR4, Board thickness: 1.6 mm

LCD Board Dimensions

The following drawing shows dimensions of the LCD board.

<Surface>



<Rear Face (View from Surface)>

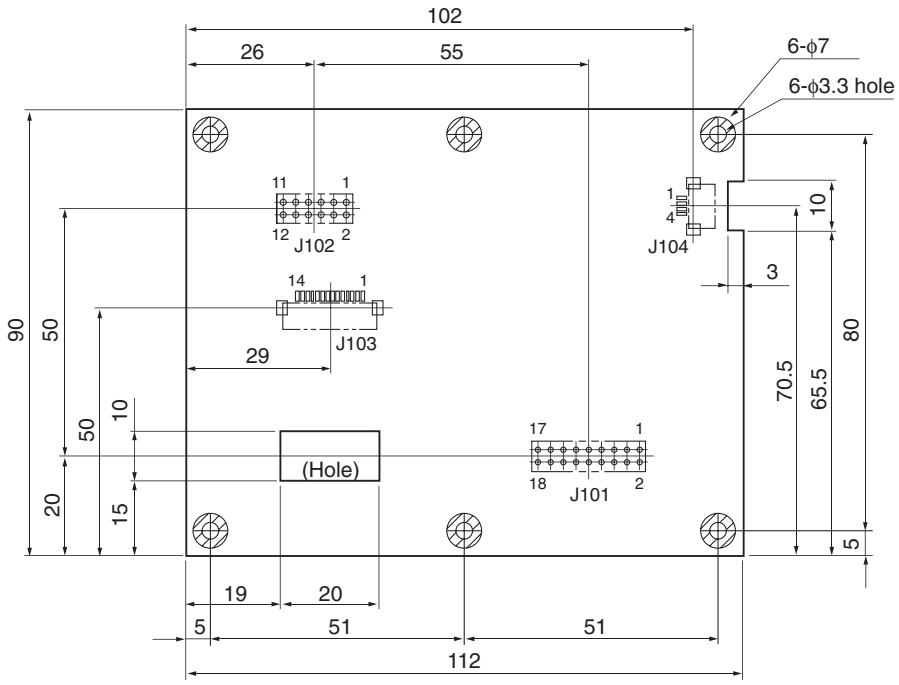


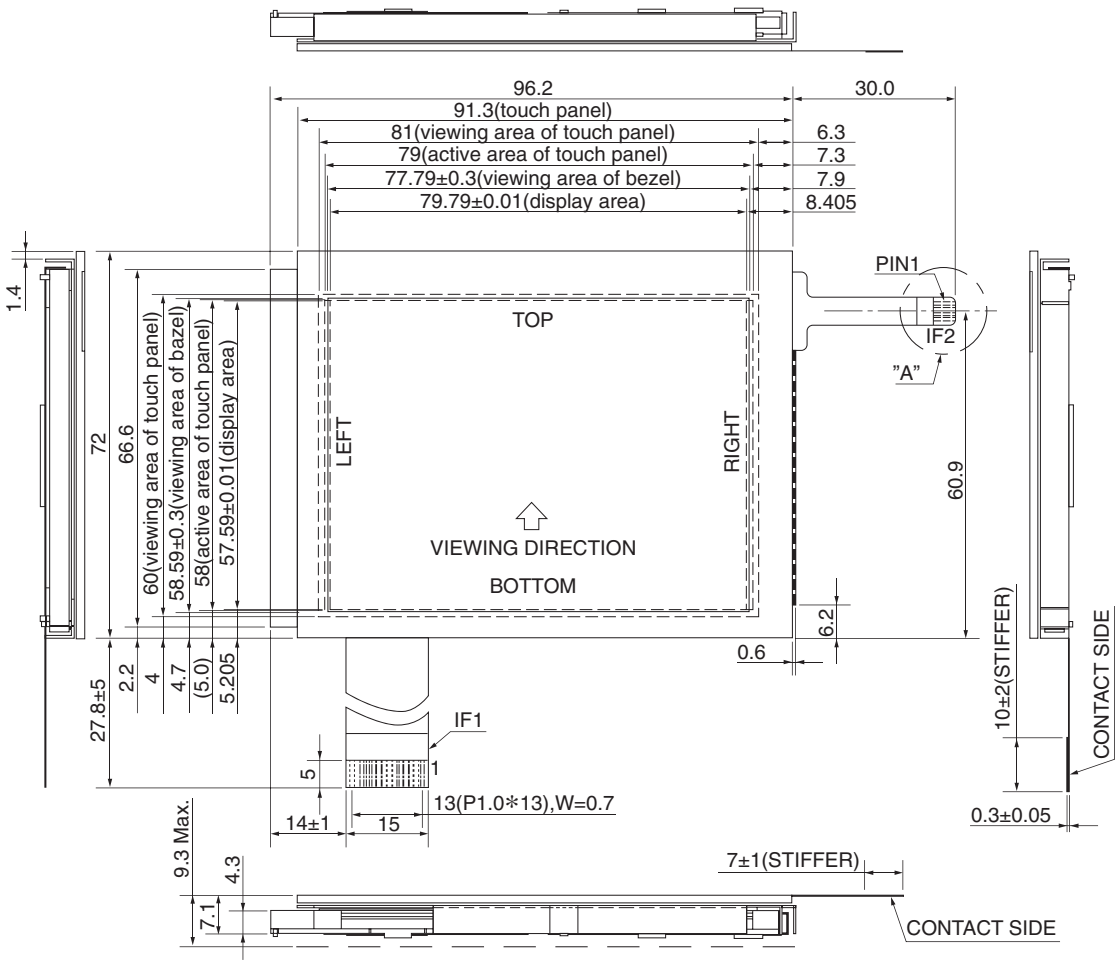
Fig. 3.2.3.1 LCD Board Dimensions

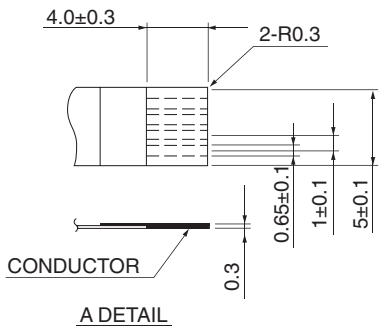
∗ Precautions

- Unit for the above dimensions is millimeter (mm).
- Board thickness: 1.6 mm
- Figure 3.2.3.1 is a rear face drawing seen from the board surface.

LCD Panel Board Dimensions

The following drawing shows dimensions of the LCD panel (EW32F92FLWP manufactured by IMAGING DISPLAY).
(Abstracted from specifications for the IMAGING DISPLAY EW32F92 series products)





UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ±0.5

Fig. 3.2.4.1 LCD Panel Dimensions

Main Parts

<CPU Board>

CPU (U13)	S1C17801	SEIKO EPSON CORP.
Crystal oscillator (32.768kHz) (X1)	FC-135	EPSON TOYOCOM CORP.
Crystal oscillator (48MHz) (X2)	FA-238	EPSON TOYOCOM CORP.
Reset switch (RESET SW) (S8)	SKQTLCE010	ALPS
Expansion connector (J7)	SSW-109-01-S-D	SAMTEC
Expansion connector (J8)	SSW-108-01-S-D	SAMTEC
Expansion connector (J12)	TSW-109-07-S-D	SAMTEC
Expansion connector (J13)	TSW-106-07-S-D	SAMTEC
ICD board connector (J6)	PS-10SD-D4T1-1	JAE
SRAM (U18)	CY62167DV30LL-55ZXI	CYPRESS
Flash(NOR) (U3)	S29JL064H55TFI000	Spansion
Flash(NAND) (U7)	MT29F2G08AACWP	MICRON
EEPROM (U17)	24AA256-I/SN	ST-Micro
POWER SW (S7)	SKRAAKE010	ALPS
Key switches (S1 - S6)	SKRAAKE010	ALPS
Rotary encoder with switch (SW2)	SIQ-02FVS3	MITSUMI
LED(RGB) (LED1)	598-9920-307F	Dialight
Power LED (Blue) (LED2)	598-8191-107F	Dialight
LED (LED3)	LTW-170TK	Lite-On
Infrared emitting module (D1)	AN333	STANLEY
Infrared receiver module (U21)	GP1UX311QS	SHARP
Infrared receiver module (for U21)	PNA4702M	Panasonic
AudioCodec (U22)	PCM3793ARHB	TI
AudioCodec Oscillator (OSC1)	SG-8002JC-12.288M-PCCB	EPSON TOYOCOM CORP.
Audio connector (J14)	SJ-43514-SMT	CUI Inc
Audio connector (J15)	SJ-3523-SMT	CUI Inc
Speakers (SP1, SP2)	NDT-03B	STAR MICRONICS
MIC (MIC1)	EM6022P-42BC10&33-G	Horn Industrial
USB miniB connector (J10)	54819-0578	molex
MMC card socket (J5)	DM1B-DSF-PEJ(22)	HIROSE
Battery holder (BAT1)	106	KEYSTONE
Coin Battery	CR2032 (3V)	maxell
Power supply connector (5V) (J4)	HEC3600-010510	Hosiden
Power Switch (SW1)	SDDJE12300	ALPS
ICDmini i/f (J9)	A2-4PA-2.54DS (71)	HIROSE
ICDmini i/f (J11)	S04B-PASK-2 (LF) (SN)	JST

<ICD Board>

USB miniB type connector	54819-0572	molex
LED (RGB)	598-9920-307F	Dialight
Reset switch (RESET SW) (SW1)	SKRAAKE010	ALPS

<LCD board>

LCD panel module	EW32F92FLWP	IMAGING DISPLAY
Connector (to connect CPU board) (J101)	DF9-13P-1V(32)	HIROSE
Connector (to connect CPU board) (J102)	DF9-9P-1V(32)	HIROSE
Connector (to connect LCD panel) (J103)	52207-1485	Molex
Connector (to connect LCD panel) (J104)	52207-0485	Molex

Functions of Each Part

ICD Board

The ICD board is a hardware tool (emulator) to facilitate the efficiency of software development for the S1C17801. It controls communication between your PC and the target IC (S1C17801) on the CPU board, providing simple software development environments for S1C17801. For information about its functional difference from the ICD Mini (S5U1C17001H), a development tool supporting all S1C17 core product models, see Chapter 6.

ICD Board Reset Switch

Pressing the reset switch (SW1) on the ICD board reboots firmware on the ICD board and outputs the target reset signal (#RESET_OUT) to the CPU board. This establishes the communication connection between the CPU board and the ICD board if they are physically connected. If the CPU board and the ICD board are not connected physically, the communication connection becomes in the stand-by status.

ICD Board LED

The LED indicates ICD board and target statuses in different colors.

- (Blue) Power on (before the initial connection with the target is established.)
- (Green) The target is currently in debug mode.
- (Red) The target is not connected, or not properly connected.
  The target is currently executing a user program.

CPU Board

The CPU board is a simple target evaluation board equipped with the target CPU (S1C17801). It is also equipped with SRAM, NOR Flash, NAND Flash, EEPROM and other external memories,as well as peripheral functions and circuits such as a LCD panel, RTC control circuit, MMC card, USB Audio IC, speaker, microphone, and remote control emitting/receiving module, enabling the CPU board to be used for the development and evaluation of control software and other purpose.

CPU Board Reset Switch

Pressing the reset switch on the CPU board (S8 mounted on the rear face) resets the CPU board.

Coin Battery

A coin cell battery (of CR2032 standard) socket is mounted on the rear face of the CPU board. The socket is used for power supply to RTCV$_{DD}$.

* Installing and Removing Coin Battery

The following describes installation and removal procedures of a coin cell to/from the socket on the rear face of the CPU board.

Install Step 1: Insert coin cell under the long metal contact on the socket with the plus (+) side up, and press it in the direction of the arrow.

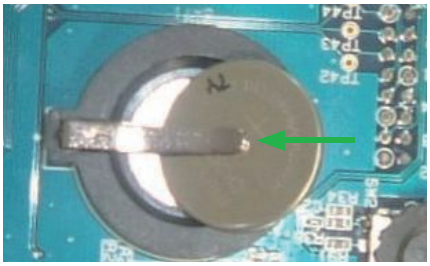


Fig. 3.4.2.1 Installing/Removing Coin Battery - 1/4

Install Step 2: Figure 3.4.2.2 shows the installation has been completed.

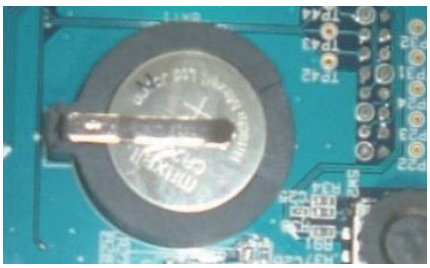


Fig. 3.4.2.2 Installing/Removing Coin Battery - 2/4

Remove Step 1: Insert a slotted screw driver into space between the coin cell and socket, lift the driver up as a lever and move it in the direction of arrow to secure a small space on the right side of the socket as shown in the figure 3.4.2.3.

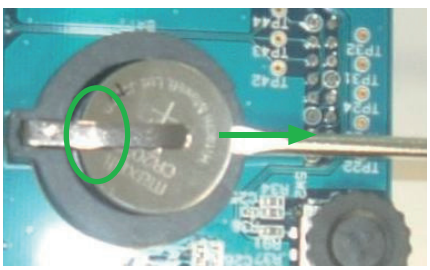


Fig. 3.4.2.3 Installing/Removing Coin Battery - 3/4

Remove Step 2: Insert the slotted driver into the space on the right side as shown in the figure 3.4.2.4. Then pressing it to the right removes the coin cell. (The cell can also be removed by lifting the driver up as a lever.)

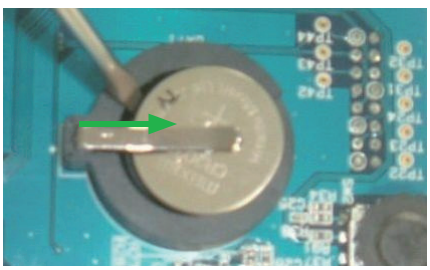


Fig. 3.4.2.4 Installing/Removing Coin Battery - 4/4

4 Block Diagram

Each block diagram for the the SVT17801 CPU board and ICD board is shown below.

<CPU Board>

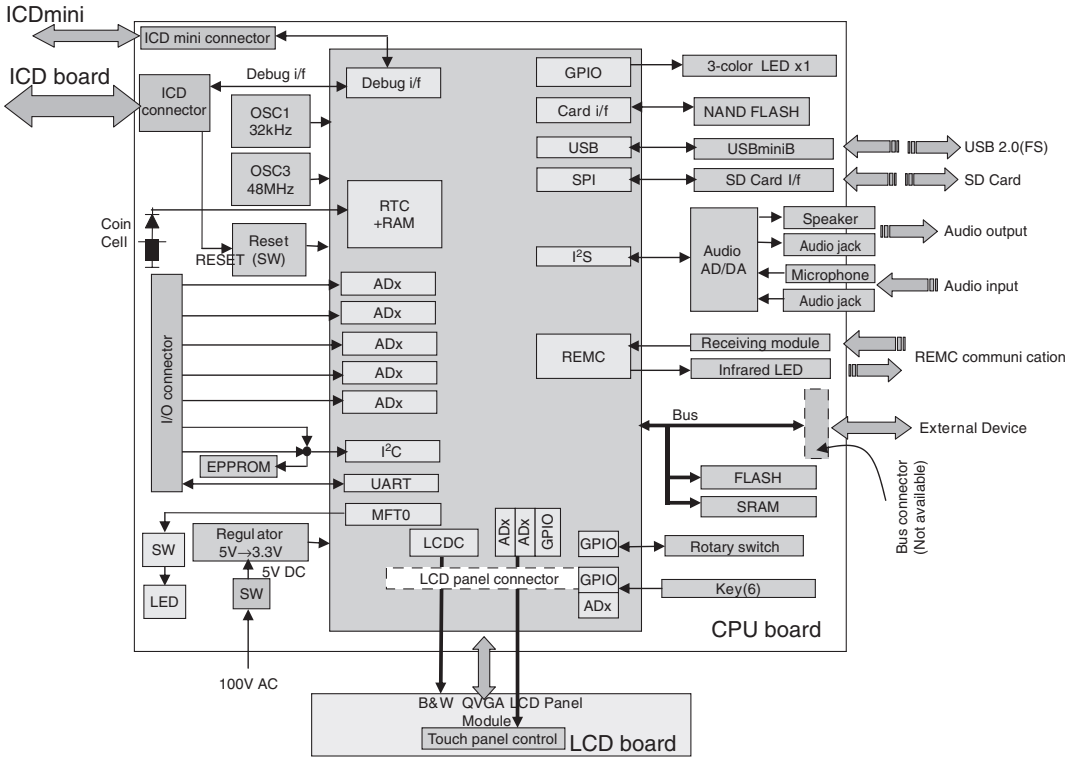


Fig. 4.1 Block Diagram for CPU Board

<ICD Board>

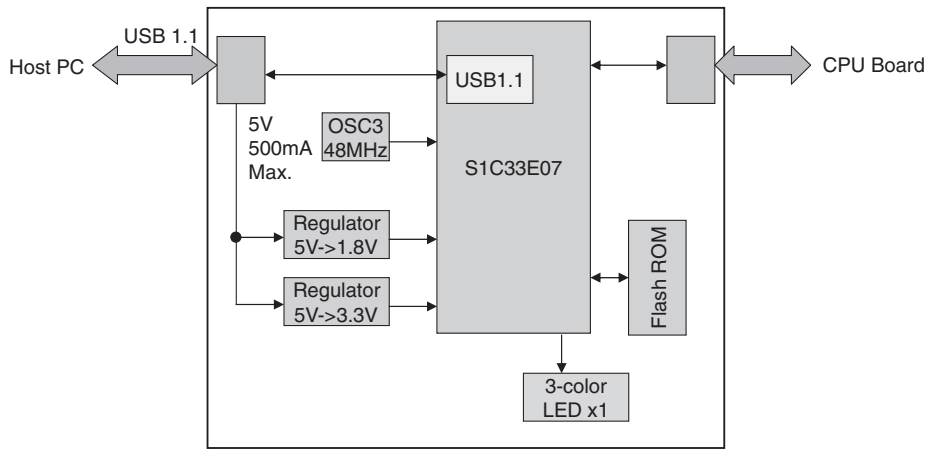


Fig. 4.2 Block Diagram for ICD Board

5 Operating Environments and Starting Procedures

By connecting with your PC via the ICD board, the SVT17801 can be operated in accordance with commands executed by a debugger on the PC. The SVT17801 CPU board can be operated as stand-alone without using the ICD board and PC. The following explains the connection and starting procedures required for each operation.

Software Simple Development Environments

The SVT17801 can provide simple development environments of software using the CPU board as a target. This can be achieved by connecting the SVT17801 to your PC via the ICD board and using the S1C17 development tool on the PC (such as GNU17 IDE, compiler and debugger included in the S5U1C17001C package).

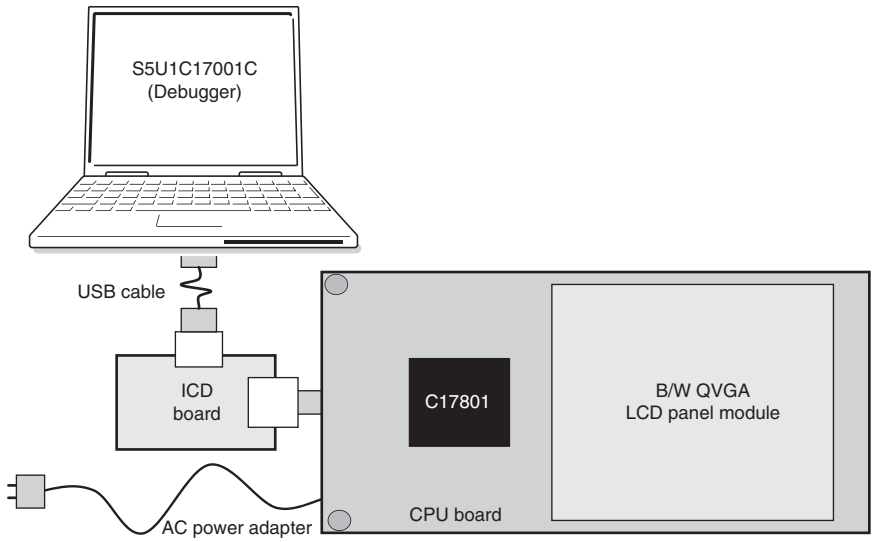


Fig. 5.1.1 Software Simple Development Environments

Operation under Software Simple Development Environments

Under these operating environments,the target CPU (the S1C17801 on the CPU board) operates according to commands executed by a debugger on your PC connected with the ICD board. A command executed by the debugger is sent to the ICD board via USB to be analyzed and converted into a debug signal, and then sent to the CPU board. The debugger on your PC can be used to download programs or data to the CPU board, or debug programs by controlling their execution and stop.

Operating Mode of CPU

The "brk" command or debugging interrupts (such as forcible breaking operation by the debugger) from the ICD board causes the target CPU (the S1C17801 on the CPU board) to stop executing the target program and enter into debug mode (or break status). In this status, commands can be executed from the debugger on your PC. LED on the ICD board lights in green during debug mode. On the other hand, the status where the target CPU executes the target program is called normal mode. LED on the ICD board lights in red during normal mode.

Connection and Start

The following describes connection and startup procedures to allow for the software simple development environments.

(1) Connect the ICD board with the CPU board. Connect JICD 10 pin connector on the ICD board with the counterpart on the CPU board. Then turn on the CPU board.

(2) Turn on the PC (if it is turned off).

(3) Connect the evaluation board to your PC via a USB cable.

(4) When a screen appears on your PC prompting you to install USB driver, install an appropriate driver. This operation is required only for the first connection. It is not required for the second connection and afterward. For the installation procedure, see the later section "Installing USB driver".

(5) Make sure that LED on the ICD board lights in blue → green (the target is in debug mode).

(6) Start the debugger on your PC to execute the program. Make sure that LED on the ICD board lights in red (the target is in normal mode).

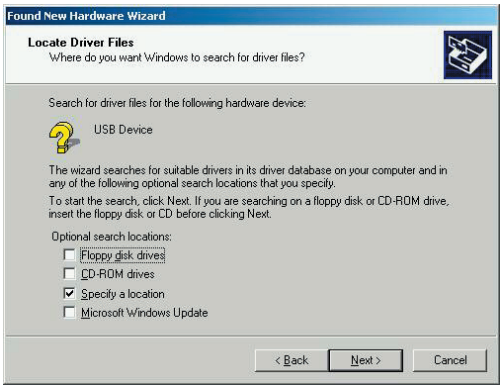
For details on the operation of the debugger and debugging commands, see the "S5U1C17001C Manual (S1C17 Family C Compiler Package)."

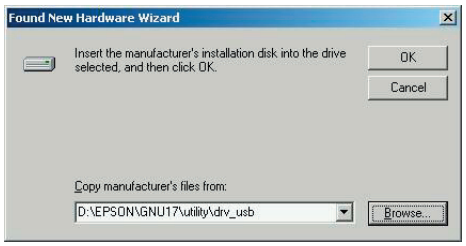
Note: Be sure never to disconnect a USB cable between PC and ICD board while the debugger is running.

Installing the USB driver

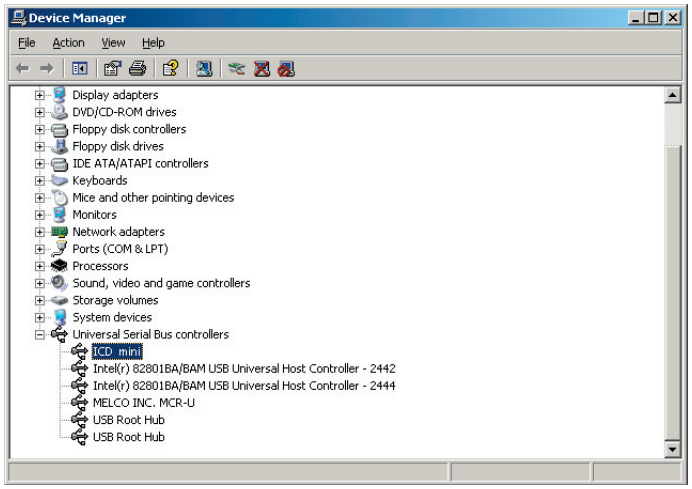
(1) When the SVT17801 is connected with the host computer via USB cable, the following screen appears.

(2) Follow the wizard to install USB driver.
For brows directory of the USB driver, specify "C:\EPSON\GNU17\utility\drv_usb."
∗ This indicates a directory path where IDE is installed.





When the USB driver has been installed successfully,it appears on the device manager as shown below.



Notes: If the driver does not appears on the device manager as shown above, install the USB driver again.

Standalone Operation of SVT17801

The SVT17801 CPU board can be operated as stand-alone without using the ICD board and PC.

Standalone Operation

In this operation environment, the S1C17801 on the CPU board operates in normal mode to execute a program written in the built-in flash memory. Therefore, a user program must be downloaded previously to the flash memory built in the S1C17801. (A demo-program is written in the flash memory of the SVT17801 as factory default.)
For information about how to download a user program to the memory, see the "S5U1C17001C Manual (S1C17 Family C Compiler Package)."

Connection and Start

The following describes a method to operate the SVT17801 as standalone.

(1) Turn on the PC (if it is turned off).

(2) While the ICD board is connected with the CPU board, connect your PC to the ICD board via USB cable, and turn on the CPU board.

(3) Start the debugger on your PC and download a user program to the flash memory built in the S1C17801. For information about downloading a program, see the "S5U1C17001C Manual (S1C17 Family C Compiler Package)."

(4) After exiting the debugger, remove the USB cable to disconnect the ICD board from your PC.

(5) Disconnect the ICD board from the CPU board, and install a coin cell battery.

(6) Press the reset switch on the CPU board. Then the S1C17801 on the CPU board starts executing a user program downloaded to the flash memory.

ICD Board Firmware Update Procedures

The SVT17801 can update the firmware of the ICD board using the debugger on your PC. The ICD board firmware will be provided by EPSON if necessary. An update file has an ".sa" extension.)
The following describes firmware update procedures.

Note: USB driver must be installed before starting firmware update.

(1) Connect the evaluation board to your PC via a USB cable.

(2) Press the reset switch on the CPU board.

(3) Start the debugger from the command prompt.
```
>cd c:\EPSON\gnu17
>gdb
```
(Specify the directory path where the gnu17 is installed.)

(4) When the debugger starts, enter the following commands.
```
(gdb) target icd usb
(gdb) c17 firmupdate path\filename.sa
```
(where "*path**filename*.sa" is the update file name.)

(5) Finally, when the LED on the ICD board gets green(●), the firmware has been updated.

(6) Press the reset switch on the ICD board to reboot the firmware.

6 Difference between ICD Board and ICD Mini

The table 6.1 shows specifications comparison between the SVT17801 ICD board and the S5U1C17001H (ICD Mini), a development tool for the S1C17 Family. While the SVT17801 is equipped with the ICD mini interface, the ICD board and the ICD mini cannot be connected at the same time. For information about how to use the ICD mini, refer to the S5U1C17001H User Manual.

Table 6.1 Comparison of Functions between ICD Board and ICD mini

Product name	S5U1C17000H ICD mini	SVT17701 (S5U1C17001T) ICD board
Corresponding core	S1C17 core	
Host interface	USB 1.1	
Maximum speed of data download	Approx. 65KB/s DCLK = at 40MHz (Max.) ∗1 Approx. 50KB/s DCLK = at 20MHz ∗1∗4	
Communications frequency with target (DCLK frequency)	4KHz - 40MHz	
Standalone flash writer function	Available	None
Firmware update function	Available	
Power supply for writing to flash ROM	Available	None
Reset signal output to target	Available	
Target system I/O support voltage	3.3V, 1.8V, and voltage input from target (1.0 - 5.0V)	3.3V
Connector to connect target	4 pins	10 pins (including reset signal) ∗2
Power supply connector for writing to flash ROM ∗3	4 pins	–

∗1 Supported frequency when I/O interface voltage = 3.3V Depending on ambient noise, temperature conditions, and types and variations of products,
the maximum frequency may become lower than the specification value.
∗2 Only for connection with the CPU board.
∗3 Separate power supply is not required for the S1C17801 to write to flash ROM.
∗4 Operating frequency is 48MHz (DCLK=24MHz) for SVT17801.

7 I/O Port

Table 7.1 lists ports on the S1C17801 and the destination of the connection for the SVT17801. For information about expansion interface and connectors, see Chapter 22.

Table 7.1 I/O Port Function List

Port	Direction	Multiplex	Signal Name	Connected to
P00	I	AIN0	P00/AIN0	Expansion I/F (Connector No.: J8)
P01	I	AIN1	P01/AIN1	
P02	I	AIN2	P02/AIN2	
P03	I	AIN3	P03/AIN3	
P04	I	AIN4	P04/AIN4	
P05	I	AIN5	P05/AIN5	Expansion I/F (Connector No.: J13)
P06	I	AIN6	P06/AIN6	
P07	I	AIN7	P07/AIN7	Key input
P10	I/O	SPI0	P10/SPI_SDI0	MMC I/F & TP52
P11	I/O	SPI0	P11/SPI_SDO0	MMC I/F & TP53
P12	I/O	SPI0	P12/SPI_SCK0	MMC I/F & TP54
P13	I/O	SPI0/SPI1	P13/SPI_SSI0/SPI_SSI1	MMC I/F & TP55
P14	I/O	SPI1	P14/SPI_SDI1	Tri-color LED
P15	I/O	SPI1	P15/SPI_SDO1	
P16	I/O	SPI1	P16/SPI_SCK1	
P20	I/O	I²S0	P20/I2S_SDO0	AudioCodecIC & TP49
P21	I/O	I²S0	P21/I2S_WS0	AudioCodecIC & TP48
P22	I/O	I²S0	P22/I2S_SCK0	AudioCodecIC & TP47
P23	I/O	I²S0	P23/I2S_MCLK0	AudioCodecIC
P24	I/O	I²S1	P24/I2S_SDI1	AudioCodecIC & TP50
P25	I/O	I²S1	P25/I2S_WS1	AudioCodecIC & TP48
P26	I/O	I²S1	P26/I2S_SCK1	AudioCodecIC & TP47
P27	I/O	I²S1	P27/I2S_MCLK1	AudioCodecIC & TP51
P30	I/O	TM0	P30/TM0	Switch IC → Uni-color LED
P31	I/O	TM0/ADTRG	P31/#TM0/#ADTRG	Rotary encoder & key input
P32	I/O	WDT/CMU	P32/WDT_CLK/ #WDT_NMI/CMU_CLK	Switch IC
P33	I/O	Memory/TM0	P33/#SMRD/#TM0	Switch IC → NAND Flash or
P34	I/O	Memory	P34/#SMWR	expansion I/F (Connector No.: J13)
P35	I/O	ICD i/f	P35/DCLK	ICD I/F (Connector No.: J6)
P36	I/O	ICD i/f	P36/DSIO	
P37	I/O	ICD i/f	P37/DST2	
P40	I/O	UART/Memory	P40/SIN0/#SMRD	Expansion I/F (Connector NO.: J8) & TP42
P41	I/O	UART/Memory	P41/SOUT0/#SMWR	Expansion I/F (Connector NO.: J8) & TP43
P42	I/O	UART/EXCL	P42/#SCLK0/EXCL0	Expansion I/F (Connector NO.: J8) & TP44
P43	I/O	REMC	P43/REMC_IN/PWMPRT0	STBY(S1C17801)
P44	I/O	REMC	P44/REMC_OUT	NAND Flash & NOR Flash
P45	I/O	WAIT	P45/#WAIT	Switch IC
P50	I/O	I²C/EXCL0	P50/I2C_SDA/EXCL0	Expansion I/F (Connector No.: J8) & EEPROM
P51	I/O	I²C	P51/I2C_SCL	Expansion I/F (Connector No.: J8) & EEPROM
P52	I/O	REMC/TM0	P52/REMC_IN/#TM0	Remote control light receiving module
P53	I/O	REMC	P53/REMC_OUT	Remote control light emitting module
P55	I/O	LCD	P55/FPLINE	Expansion I/F (Connector No.: J12)
P56	I/O	LCD	P56/FPSHIFT/#TM0	
P57	I/O	LCD	P57/FPDRDY	
P60	I/O	Memory	P60/A0/#BSL	Expansion I/F (Connector No.: J18) & SRAM
P61	I/O	Memory	P61/A1	Expansion I/F (Connector No.: J18) & SRAM

Port	Direction	Multiplex	Signal Name	Connected to
P62	I/O	Memory	P62/A2	Expansion I/F (Connector No.: J18) & SRAM & NOR Flash
P63	I/O	Memory	P63/A3	
P64	I/O	Memory	P64/A4	
P65	I/O	Memory	P65/A5	
P66	I/O	Memory	P66/A6	
P67	I/O	Memory	P67/A7	
P70	I/O	Memory	P70/A8	
P71	I/O	Memory	P71/A9	
P72	I/O	Memory	P72/A10	
P73	I/O	Memory	P73/A11	
P74	I/O	Memory	P74/A12	
P75	I/O	Memory	P75/A13	
P76	I/O	Memory	P76/A14	
P77	I/O	Memory	P77/A15	
P80	I/O	Memory	P80/A16	
P81	I/O	Memory	P81/A17	
P82	I/O	Memory	P82/A18	
P83	I/O	Memory	P83/A19	
P84	I/O	Memory	P84/A20	
P85	I/O	Memory	P85/A21	Expansion I/F (Connector No.: J18) & NOR Flash
P86	I/O	Memory	P86/A22/CMU_CLK	
P90	I/O	Memory	P90/D0	Expansion I/F (Connector No.: J18) & SRAM & NOR Flash & NAND Flash
P91	I/O	Memory	P91/D1	
P92	I/O	Memory	P92/D2	
P93	I/O	Memory	P93/D3	
P94	I/O	Memory	P94/D4	
P95	I/O	Memory	P95/D5	
P96	I/O	Memory	P96/D6	
P97	I/O	Memory	P97/D7	
PA0	I/O	Memory	PA0/#CE0	NOR Flash
PA1	I/O	Memory	PA1/#CE1	SRAM
PA2	I/O	Memory	PA2/#CE2	NAND Flash
PA3	I/O	Memory	PA3/#CE3	NAND Flash
PA4	I/O	Memory	PA4/#RD	NOR Flash & SRAM
PA5	I/O	Memory	PA5/#WRL	NOR Flash & SRAM
PA6	I/O	Memory	PA6/#WRH/#BSH	SRAM
PB0	I/O	Memory	PB0/D8	Expansion I/F (Connector No.: J18) & SRAM & NOR Flash
PB1	I/O	Memory	PB1/D9	
PB2	I/O	Memory	PB2/D10	
PB3	I/O	Memory	PB3/D11	
PB4	I/O	Memory	PB4/D12	
PB5	I/O	Memory	PB5/D13	
PB6	I/O	Memory	PB6/D14	
PB7	I/O	Memory	PB7/D15	
PC0	I/O	LCD	PC0/FPDAT0/CMU_CLK	Rotary encoder
PC1	I/O	LCD	PC1/FPDAT1/#WDT_NMI	
PC2	I/O	LCD	PC2/FPDAT2/#ADTRG	Switch IC → NAND Flash or reset
PC3	I/O	LCD	PC3/FPDAT3/PWMPRT0	Switch IC → NAND Flash or expansion I/F (Connector No.: J8)
PC4	I/O	LCD	PC4/FPDAT4	Expansion I/F (Connector No.: J12)
PC5	I/O	LCD	PC5/FPDAT5	
PC6	I/O	LCD	PC6/FPDAT6	
PC7	I/O	LCD	PC7/FPDAT7	

8 Jumper Switch Settings

Three jumper switches are installed on the surface of the SVT17801. Each function is as follows:

Setting for JP1

JP1 can be used to select Wakeup Enable or Disable as shown in the following. 1-2 on JP1 must be shorted to select Wakeup Enable. Wakeup Enable can be controlled by the Wakeup pin on the S1C17801 or on-board power switch. For details, see the description of RTC control circuit in Chapter 10. Shorting 2-3 on JP1 disables the Wakeup function.
Factory default setting for JP1 is Wakeup Enable.

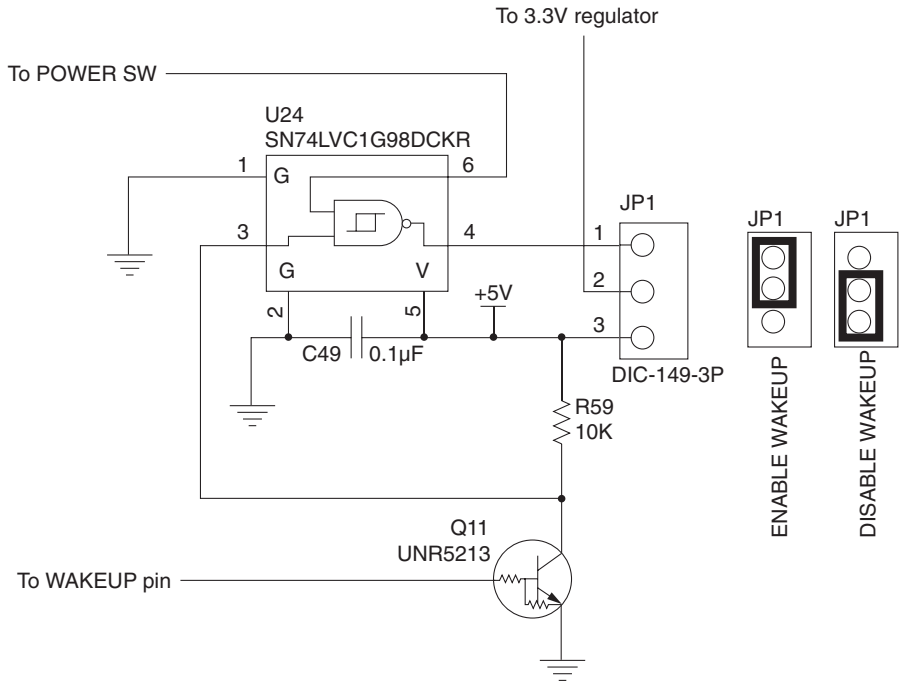


Fig. 8.1.1 JP1 Related Circuit

Setting for JP2

JP2 can be used to select the power supply source for RTCV$_{DD}$ as shown in the following. Short 2-3 on JP2 to select V$_{DD}$ for the power supply to RTCV$_{DD}$, whereas 1-3 to select battery. For details, see the description of RTC control circuit in Chapter 10. Note that, when 1-2 is shorted, a coin cell battery is required to activate RTCV$_{DD}$. Factory default setting for JP2 is 1-2 shorted.

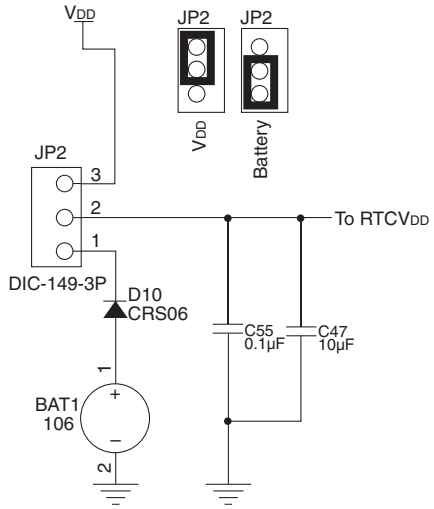


Fig. 8.2.1 JP2 Related Circuit

Setting for JP3

JP3 wiring, allowing for three functions, is shown in the following.

* 1-2 Shorted
  Power is supplied to LCD backlight. Shorting 3-4 is not allowed while 1-2 is shorted.

* 3-4 Shorted
  Power with phase generated by.MFT0 on the S1C17801 is supplied to LCD backlight. It can be used to adjust the brightness of LCD backlight. Shorting 1-2 is not allowed while 2-3 is shorted. For details, see Chapter 15 "LED/LCD BACKLIGHT CONTROL CIRCUIT WITH MFT0."

* 5-6 Shorted
  Power with phase generated by MFT0 is supplied to LED3. It can be used to adjust the brightness of LED3. Either 1-2 or 2-3 can be shorted while 5-6 is shorted. For details, see Chapter 15 "LED/LCD BACKLIGHT CONTROL CIRCUIT WITH MFT0."

Factory default setting for JP3 is 1-2 and 5-6 shorted.

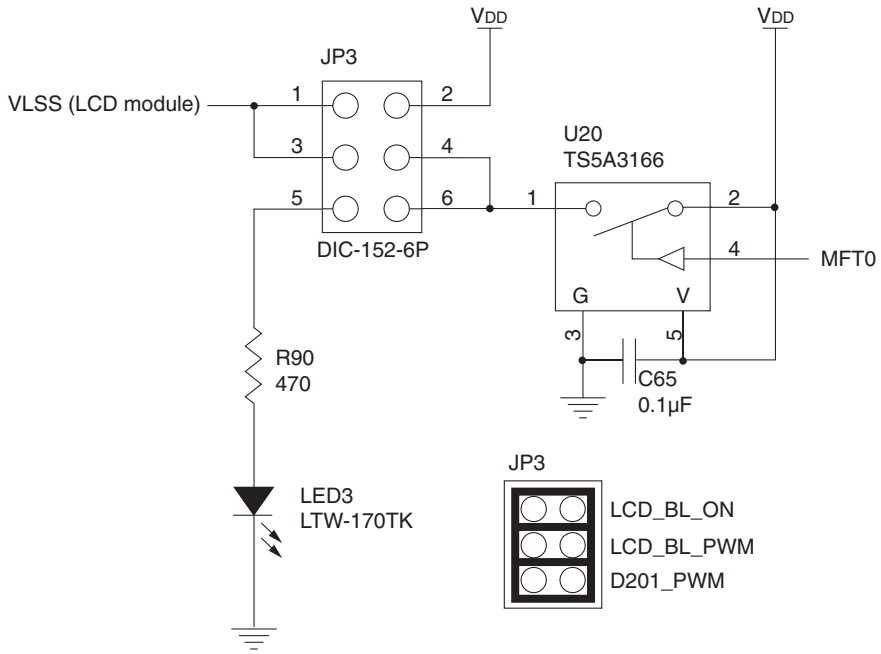


Fig. 8.3.1 JP3 Related Circuit

9 Connection Circuit to External Memory

SRAM, NOR Flash, NAND Flash, and EEPROM are connected to the SVT17801 as external memory modules.

SRAM Connection Circuit

CYPRESS 16M bits SRAM (CY62167DV30) is installed on the SVT17801. The following diagram shows how the EEPROM is connected to the SVT17801.

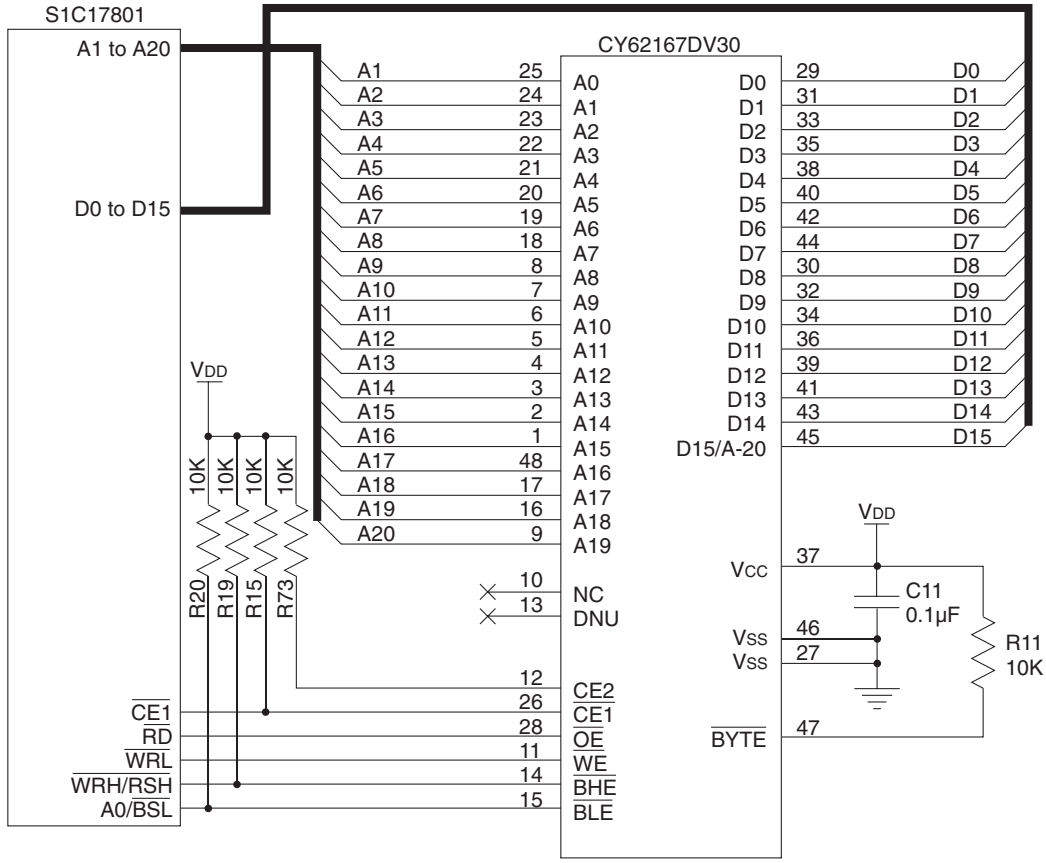


Fig. 9.1.1 SRAM Connection Circuit

NOR Flash Connection Circuit

SPANION 64M bits NOR Flash (S29JL064H) is installed on the SVT17801. The following diagram shows how the EEPROM is connected to the SVT17801.

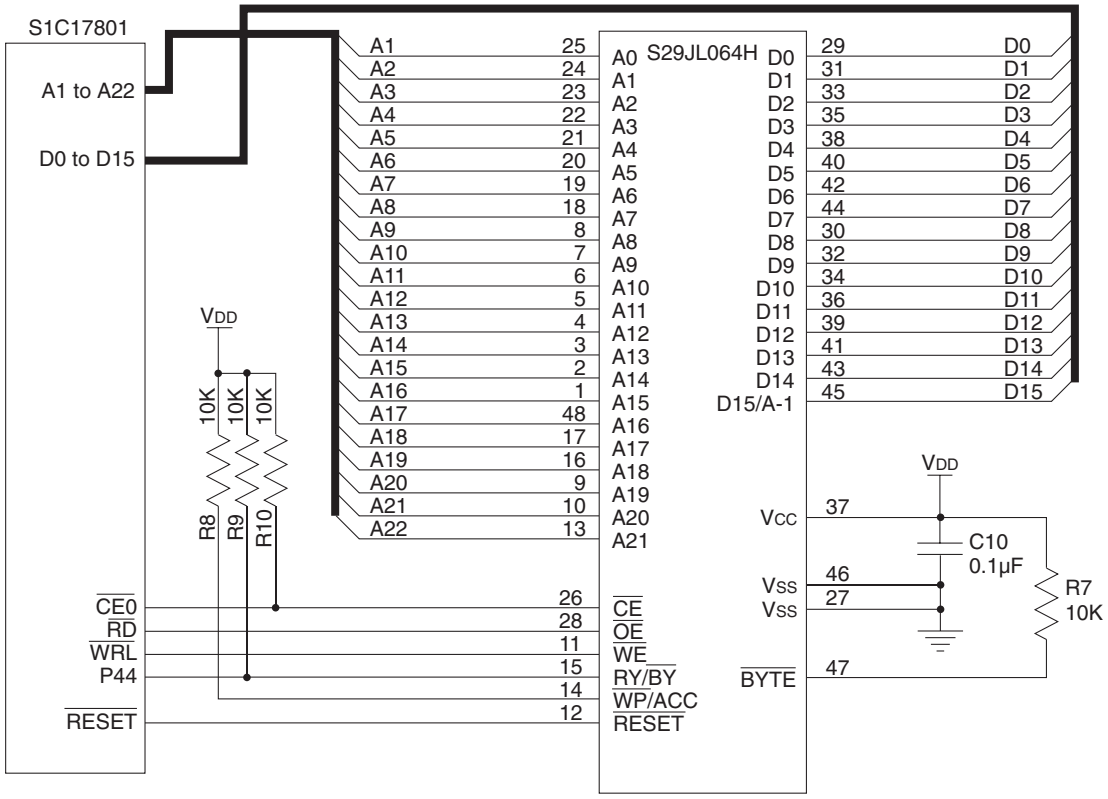


Fig. 9.2.1 NOR Flash Connection Circuit

NAND Flash Connection Circuit

MICRON 2G bits NAND Flash (MT29F2G08AACWP) is installed on the SVT17801. The following diagram shows how the EEPROM is connected to the SVT17801.

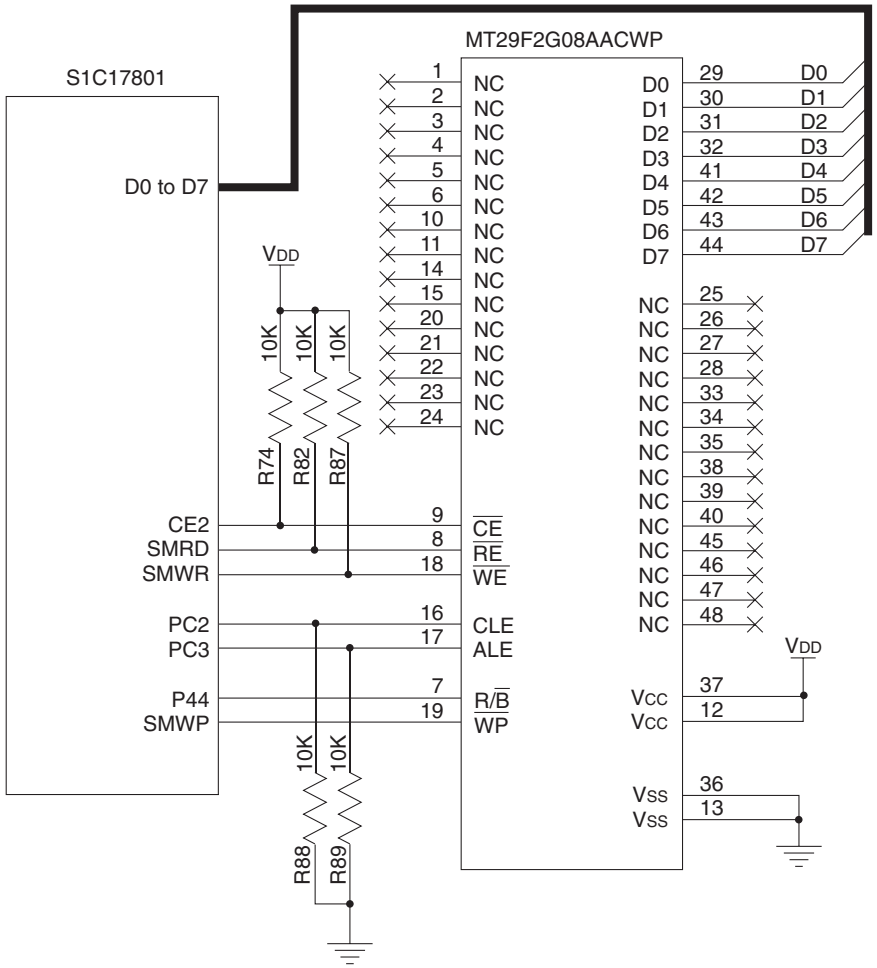


Fig. 9.3.1 NAND Flash Connection Circuit

EEPROM Connection Circuit

MICROCHIP 256K bits EEPROM (24AA256) is installed on the SVT17801. The following diagram shows how the EEPROM is connected to the SVT17801.

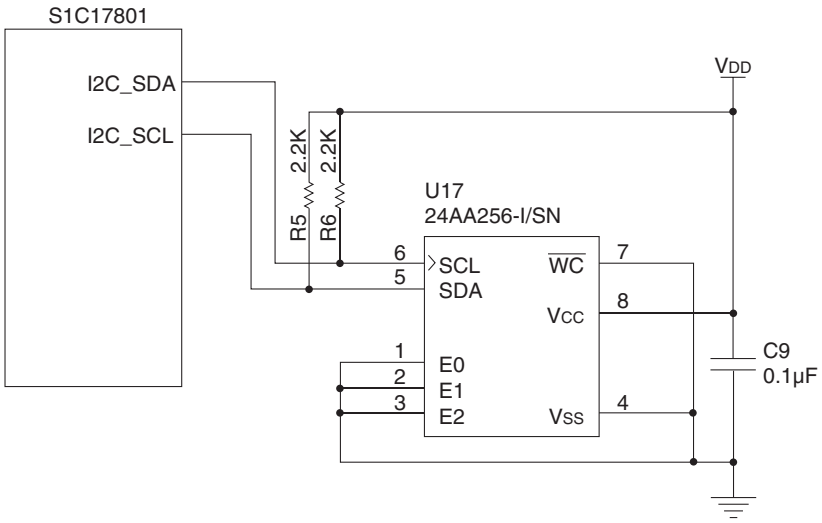


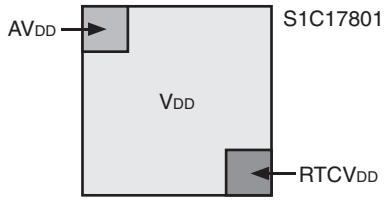
Fig. 9.4.1 EEPROM connection circuit

10 Power Control Circuit for Battery Backup Function

SVT17801 has a battery backup function, and is equipped with a power control circuit allowing for this function.

Battery Backup Function

Three power supply lines are available on the S1C17801, i.e., V_{DD}, AV_{DD} and $RTCV_{DD}$. V_{DD} covers CPU core, logic circuits, and I/O interface circuits, AV_{DD} covers analog circuits (ADC), and $RTCV_{DD}$ covers RTC and IVRAM. The battery backup function supplies power only to $RTCV_{DD}$ while stopping the power to AV_{DD} and V_{DD}. This means that the function stops all operations except operating RTC and retaining contents inside IVRAM with low power consumption. Because the power is supplied only to the minimum indispensable functions, leak current can also be reduced drastically compared with sleep mode.



The SVT17801 is designed to connect the coin battery (CR2032) with $RTCV_{DD}$, enabling RTC to keep functioning and IRAM to retain its contents even if power supply from AC/DC adapter should be stopped.
In normal status, the power is supplied from AC/DC adapter without using the battery.

Power Control Circuit for Battery Backup Function

Figure 10.2.1 shows the power control circuit for SVT17801 battery backup function.

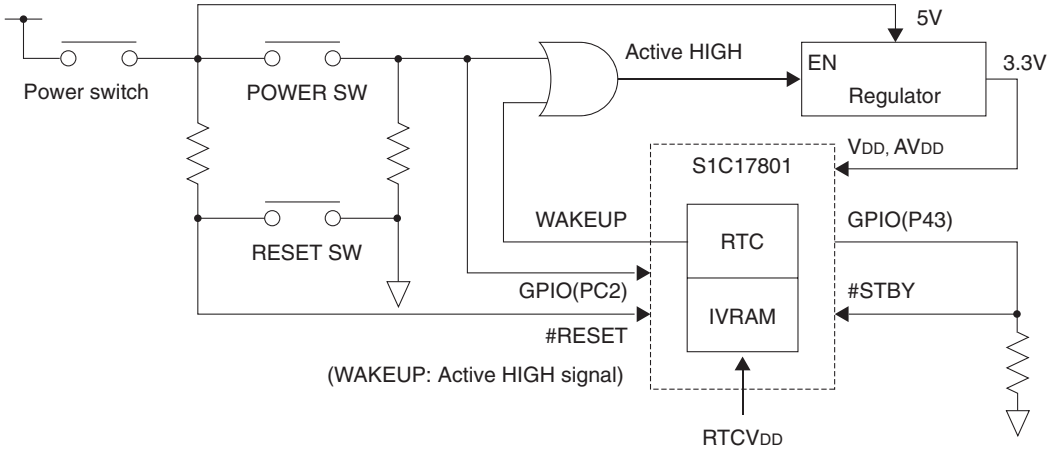


Fig. 10.2.1 Power Control Circuit for Battery Backup Function

#STBY Pin

This pin is used to disconnect the RTCVDD line from the VDD line (AVDD line) electrically.
If a LOW signal is input to the pin, area covered by the RTCVDD line becomes electrically independent of other area. Stopping power supply to the VDD line (AVDD line) while a high signal is input causes inconstant signals to be entered into RTC or IVRAM, or current to be leaked from the RTCVDD line to the VDD line. Therefore, be sure to input a LOW signal to #STBY pin before stopping power supply to the VDD line (AVDD line).

∗ Notes: The RTCVDD area cannot be accessed while the #STBY pin is in LOW status. A HIGH signal must be output from P43 to make the #STBY pin HIGH status before gaining access to the RTCVDD area.

WAKEUP Pin

This signal pin is used to restore the SVT17801 from battery backup status to normal status.
The VDD and AVDD lines can be turned on using the WAKEUP pin. For the SVT17801, this pin is connected to the ENABLE pin on regulator,and so the power supply can be resumed by outputting a HIGH signal to the ENABLE pin.
The WAKEUP pin can be controlled by using RTC.

JP2 and JP3 Settings

In order to enable backup battery function on the circuit installed on SVT17801 as shown in the figure 10.2.1, JP2 and JP3 must be set to WAKEUP ENABLE and Battery respectively (both factory default).
JP2 is located just before the WAKEUP pin's entering into an OR circuit, and if JP2 is set to WAKEUP DISABLE, 5V instead of WAKEUP pin is input to the OR circuit, turning regulator always ON.
JP3 selects supply source of RTCVDD shown in the figure 10.2.1. If Battery is selected, RTCVDD is supplied from the coin cell battery (CR2032) and if VDD is selected, RTCVDD is supplied from VDD. For detail of JP settings, see Chapter 8.

RSTO (Power Switch) and WAKEUP Pin

The following list shows GPIO (PC2) status and VDD voltage according to power switch and WAKEUP pin statuses when JP1 and JP2 are set to EnableWakeup and Battery respectively in the circuit shown in the figure 10.2.1.

Table 10.2.1 PC2 and VDD Status According to Power Switch and WAKEUP Pin

Power Switch	WAKEUP (HIGH Active)	GPIO(PC2)	VDD (V)
CLOSE (being pressed)	HIGH	HIGH	3.3
OPEN	HIGH	LOW	3.3
CLOSE (being pressed)	LOW	HIGH	3.3
OPEN	LOW	LOW	0

GPIO(PC2) is a signal representing OPEN/CLOSE status of power switch, and used when controlling power supply.

Shifting to Standby Mode

The following is an example to show how to set up standby mode in the circuit shown in the figure 10.2.1.

① Set JP1 to EnableWakeup and turn the system power (VDD) on.

② CPU starts working.

③ After setting P43 to HIGH output and the STBY pin to HIGH, set WAKEUP to HIGH active and WAKEUP output signal to HIGH. (to enable WAKEUP status)

• • •

④ Press power switch. (Pressing the power switch turns PC2 HIGH.)

⑤ If PC2's HIGH status is detected, set P43 to HIGH output and the STBY pin to HIGH (to enable write to IVRAM inside RTC).

⑥ Write RTC setting data to IVRAM.

⑦ Set the WAKEUP signal to LOW. → ∗ The power switch is being pressed during above steps.

⑧ Setting for standby mode has been completed. (RTCVDD is running in ON status.)

After ⑧, the VDD line (AVDD line) can be turned off.

Releasing Standby Mode

The following is an example to show how to release standby mode in the circuit shown in the figure 10.2.1.

(Example 1)

① In Step ⑤ of above set-up example 1, the standby mode is released (WAKEUP pin is turned HIGH) after predefined time has passed, and the output of regulator shown in figure 10.2.1 becomes always 3.3V.

(Example 2)

① Press power switch.
② While the power switch is being pressed, the output of regulator shown in figure 10.2.1 becomes 3.3V, S1C17801 starts operating and, immediately after that, the standby mode is released by turning the WAKEUP signal HIGH.
③ By turning the WAKEUP signal HIGH at Step ②, the output of regulator shown in figure 10.2.1 becomes always 3.3V.

∗ This power control circuit should be used only for reference. The circuit is designed for reducing the current consumption of whole system by turning the VDD line (AVDD line) off. This technique is effective for the case where the VDD line (AVDD line) has a longer power-off time, or a board has many peripheral parts with relatively HIGH current consumption. Other technique (such as Sleep or Halt) may still be advantageous depending on your approach to control the overall system. We recommend you review all necessary factors to choose the optimal way when you design a total system.

11 LCD Panel Connection Circuit

The S1C17801 has a built-in LCD controller (LCDC) that supports the monochrome STN LCD panel and parallel interface. The SVT17801 is equipped with the QVGA panel module (EW32F92FLWP including driver) with a built-in monochrome STN panel.

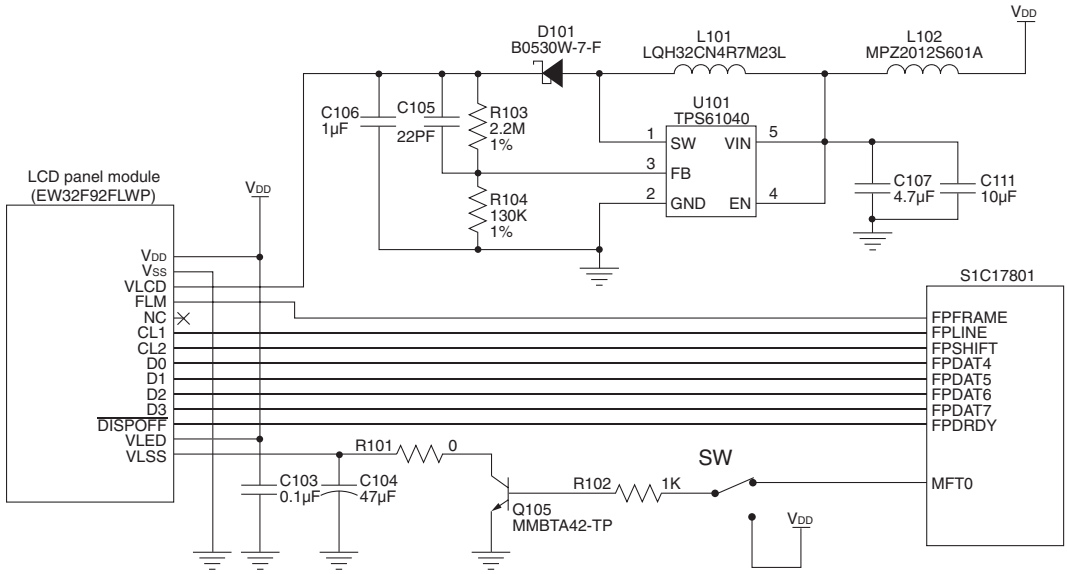


Fig. 11.1 LCD Panel Module Connection Circuit

This panel module is equipped with a 4-bit STN LCD panel, to which data bus is connected as shown above. The following lists function of each signal on the module side.

Table 11.1 Name and Function of Signal on LCD Panel Module

Signal Name	Functionalities
V_{DD}	Logic power supply inside module
V_{SS}	GND of logic power supply inside module
VLCD	LCD driver power supply
FLM	Frame clock
CL1	Display data line clock
CL2	Display data shift clock
D0	Display data bus
D1	Display data bus
D2	Display data bus
D3	Display data bus
DISPOFF	LCD ON/OFF Control (L:OFF, H:ON)
VLED	Backlight power supply
VLSS	Backlight power supply

For information about controlling the LCD panel, see the Application Note.

Touch Panel Controller Connection Circuit

The touch panel function is installed in the LCD panel module on the SVT17801. The following shows how the touch panel is connected to the S1C17801.

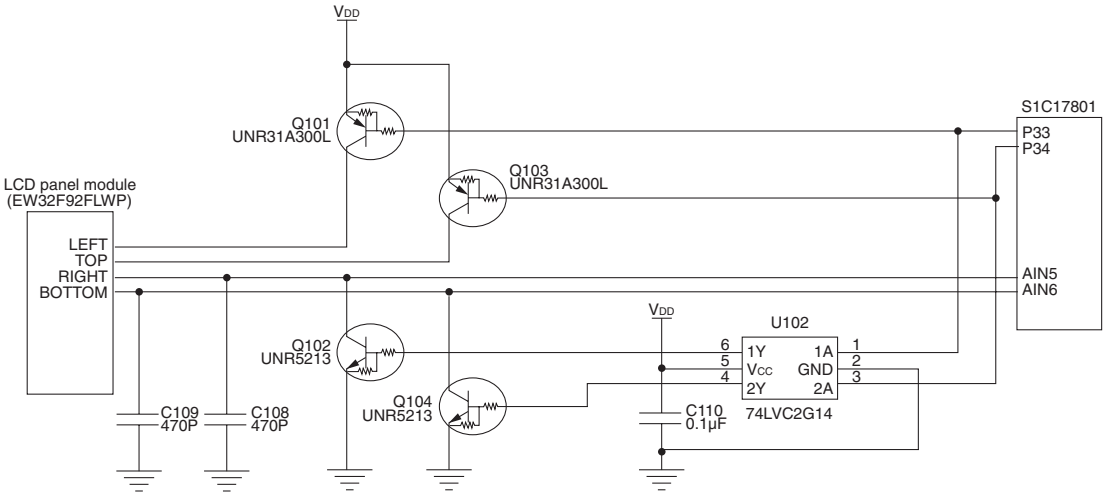


Fig. 11.1.1 Touch Panel Connection Circuit

In the above connection diagram (figure 11.1.1), panel's touch position information entered from AIN5/AIN6 is obtained as an AD value while the circuit shown above is controlled by P33/P34 of the S1C17801. The following lists each signal status of the panel module and the S1C17801.

Table 11.1.1 Function of Touch Panel Control Signal

	Pin No.	X-axis	Y-axis
S1C17801	P33	LOW	HIGH
	P34	HIGH	LOW
	AIN5	LOW	0 to V_{DD}(V)
	AIN6	0 to V_{DD}(V)	LOW
LCD panel module	LEFT	HIGH	Hi-Z
	TOP	Hi-Z	HIGH
	RIGHT	LOW	0 to V_{DD}(V)
	BOTTOM	0 to V_{DD}(V)	LOW

In order to obtain panel's touch position information on X-axis of the figure 11.1.2, an AD value obtained from AIN6 is used to determine the position of X-axis when P33 is turned LOW while P34 HIGH as shown in X-axis fields shown in the table 11.1.1. (The AIN6 value becomes gradually larger for the left side of the figure 11.1.2.) On the other hand, to obtain panel's touch position information on the Y-axis of the figure 11.1.2, an AD value obtained from AIN5 is used to determine the position of Y-axis when P33 is turned HIGH while P34 LOW as shown in Y-axis fields of table 11.1.1. (The AIN6 value becomes gradually larger for the upper side of the figure 11.1.2.) This principle to obtain X-axis and Y-axis data helps acquire two-dimensional touch position information by obtaining X-axis and Y-axis AD values while alternately switching between P33 and P34 statuses with a short duration.

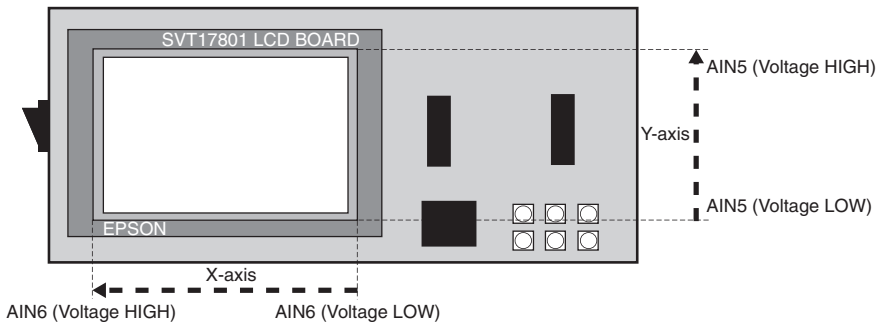


Fig. 11.1.2 Image of X-axis and Y-axis Analog Values of Touch Panel

12 Key Input Circuit on CPU Board

Switches connected to the SVT17801 (S1 - S6) are connected with the AD input port (AIN7) and input port (P31) on the S1C17801 as shown in the figure 12.1.

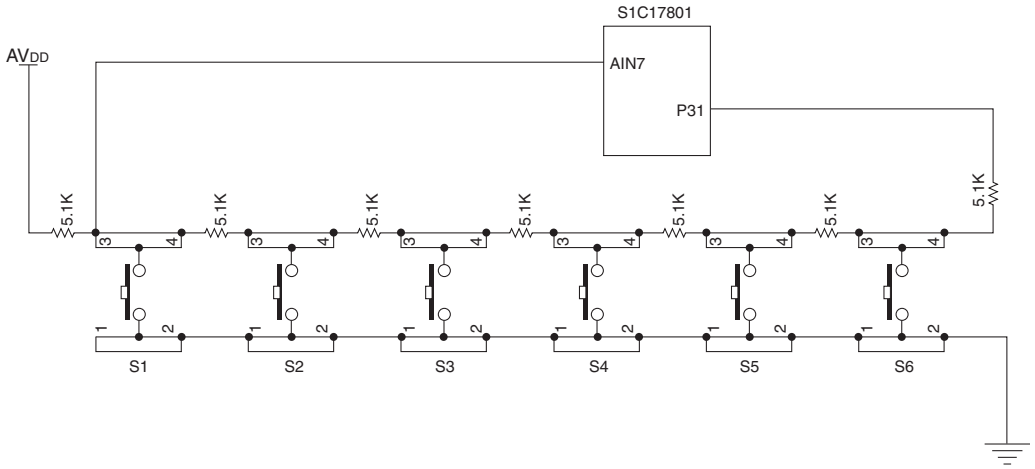


Fig. 12.1 Key Input Connection Circuit on CPU Board

In this circuit, the press of a switch is detected by the port (P31) status and the pressed switch is determined by detecting an input value of AD (AIN7).
The mechanism of detecting the switch status by the port (P31) status is as follows: If all switches are open, the port (P31) is in HIGH state as it is pulled up by the 35.7KΩ resistor (5.1KΩ x 7) as shown in the figure 12.1. If any of the switches is pressed, on the other hand, the pull-down resistor value becomes smaller than the pull-up resistor value, and this turns the port (P31) LOW. The mechanism of this circuit enables the press of any switch to be detected by using interrupt or other method.
Figure 12.1 also indicates that the pressed switch can be determined by the variance of ratio between the pull-up resistance value and the pull-down resistance value, because the ratio changes depending on the switch being pressed. The change can be detected by an AD (AIN7) input value. Figure 12.2 shows the equivalent circuit of the figure 12.1.

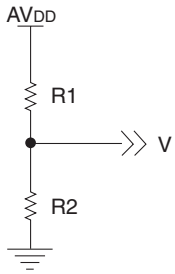


Fig. 12.2 Equivalent Circuit of Single Key Input

The following equation is satisfied in this equivalent circuit:

$$V = R2/(R1+R2) \times AV_{DD}$$

"V" value for each switch is obtained by resistance values of R1 and R2 that are obtained when the switch is pressed. Thus the pressed switch can be determined by comparing the "V" value with the value actually entered into AD (AIN7).

13 Rotary Encoder Connection Circuit

The rotary encoder connected to the SVT17801 is connected with three port inputs (P31, PC0 and PC1) on the S1C17801 as shown in the figure 13.1.

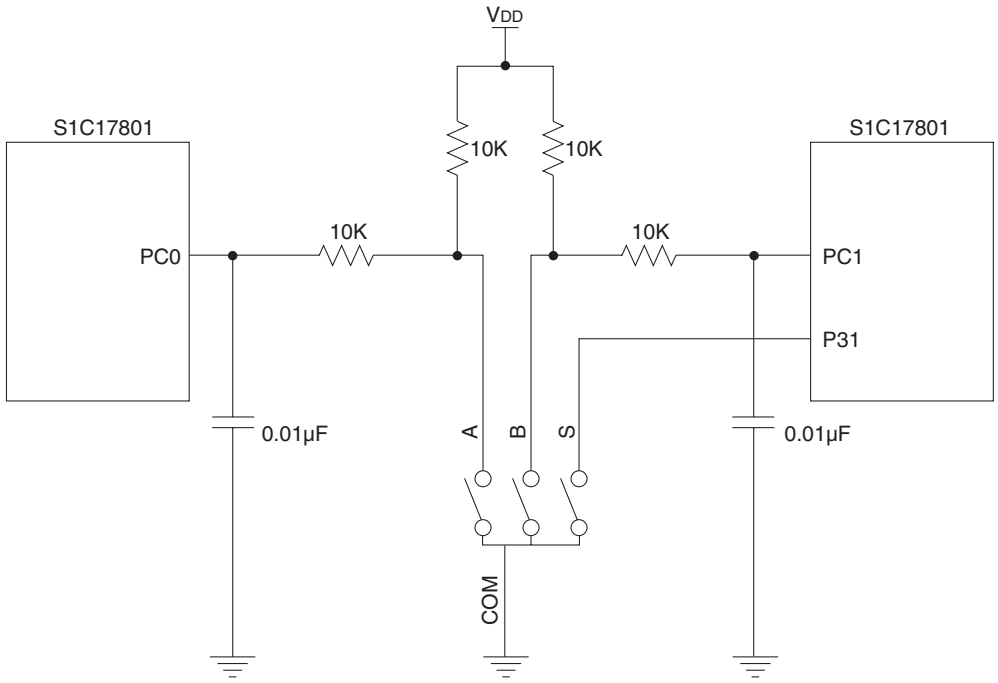


Fig. 13.1 Rotary Encoder Connection Circuit

Rotating the rotary encoder closes the A and B switches shown above, and the time difference of switching occurs depending on the rotative direction. When the encoder does not rotate, both of two ports connected to the S1C17801 are pulled up to HIGH. When the encoder rotates, on the contrary, they are turned LOW, and phase difference arises between the HIGH and LOW timings of those ports. The phase difference can be detected by software to govern the rotative direction. As a switch is directly connected to a port, pressing the switch turns the port LOW. The LOW zone can be detected by software.

14 Tri-color LED Connection Circuit

The SVT17801 is equipped with a tri-color LED being connected to the S1C17801 as shown in the following diagram.

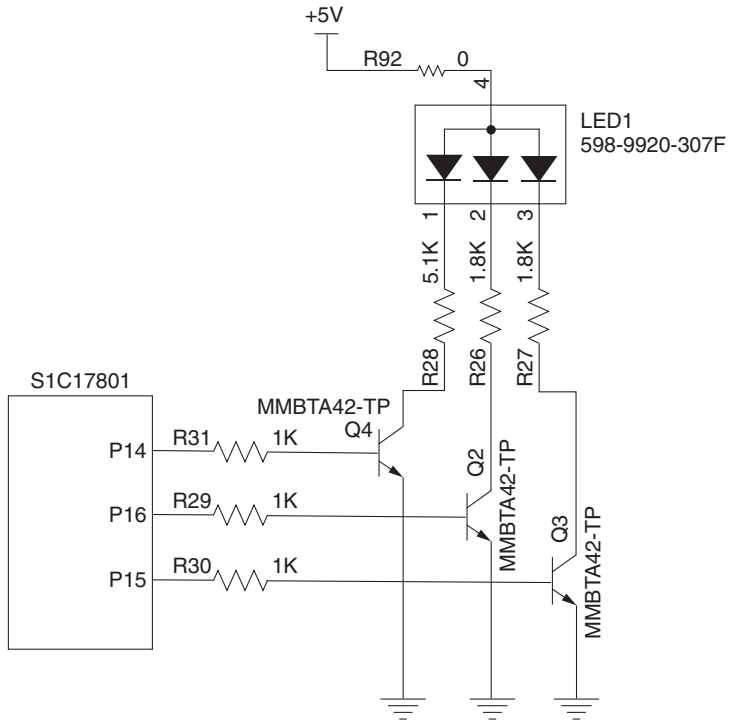


Fig. 14.1 Tri-color LED Connection Circuit

As the figure 14.1 shows, P14/P15/P16 ports are connected to the tri-color LED, H/L combination of which can represent total seven colors. The following table lists the LED colors formed by H/L combination of each port.

Table 14.1 Color on Tri-color LED Corresponding to Port Status

S1C17801			Color on Tri-color LED
P16	P15	P14	
L	L	L	(light off)
L	L	H	(green)
L	H	L	(blue)
L	H	H	(aqua)
H	L	L	(red)
H	L	H	(orange)
H	H	L	(purple)
H	H	H	(white)

15 LED/LCD Backlight Control Circuit with MFT0

The SVT17801 is equipped with a LED that can be controlled by MFT0. The following diagram shows how the EEPROM is connected to the SVT17801.

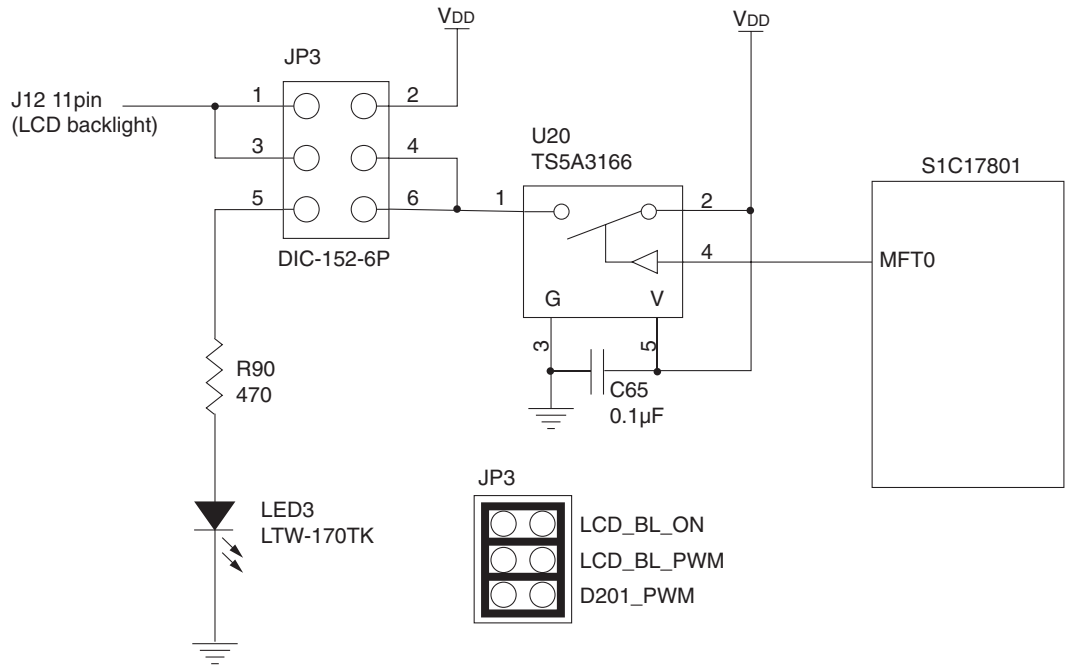


Fig. 15.1 Connection Circuit between MFT0 and LED/LCD Backlight

Pre-stage switching IC (TS5A3166) is switched by changing phase in MFT0 H/L areas, and brightness of the LED can be changed visually by turning ON and OFF the backlight of LED and LCD panel repeatedly in accordance with the MFT0 phase.

- **MFT0 is an I/O port with 12 mA of drive current. A circuit shown in the figure 15.1.has a pre-stage switch IC, which however can be replaced simply by a 470Ω resistor for direct drive. (The drive current in this case is approximately 7 mA.)**

16 Infrared Emitting Diode/Receiving Module Connection Circuit

Following diagram shows the connection of infrared emitting diode (AN333)/infrared receiving modules (GP1UX31QS/GP1UX51QS/PNA4702M) installed on the SVT17801.

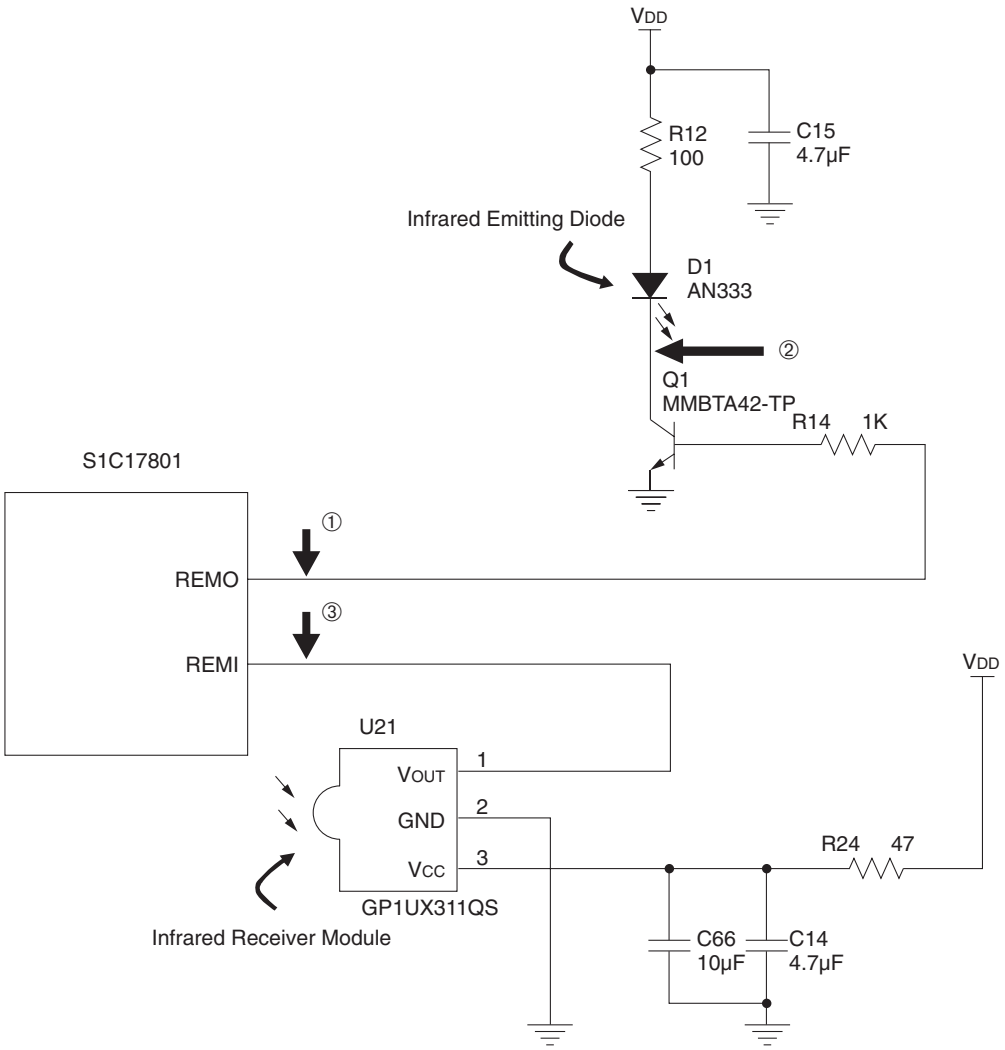


Fig. 16.1 Infrared Emitting Diode/Receiving Module Connection Circuit

Emitting and Receiving from/by Infrared Area

When two SVT17801 units are used for sender and receiver as shown in the figure 16.1.1, that is one for emitting and the other for receiving, waveform from each part ① to ③ of the infrared area are described in this section.

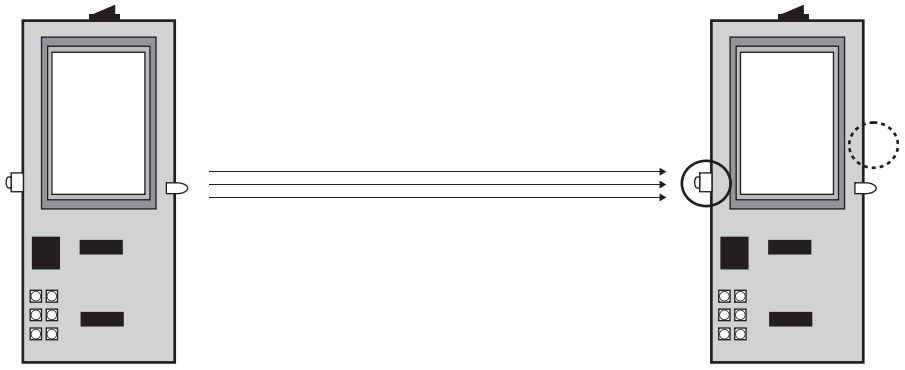


Fig. 16.1.1 Infrared Emission/Reception Evaluation Environment Using SVT17801

* The following describes the transmit waveform ① from REMO on the S1C17801, and corresponding waveforms ② and ③. For the monitoring points of ① to ③, see Table 16.1.

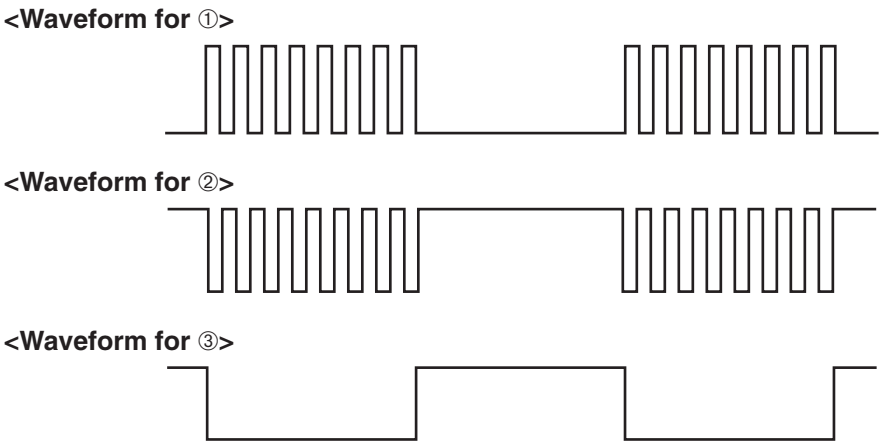


Fig. 16.1.2 Waveform for Each Point Shown in Figure 16.1

* Infrared communication in this case covers approximately 3 m by our measurement when emitting and receiving modules are placed face to face without any obstacle between them. Please use this value only for reference.
* A solid red circle on the receiver side in the figure 16.1.1. shows the location where the infrared receiving module is installed. A spare module can be installed in the area marked by a dotted red circle. (Module is not installed in the area marked by a dotted red circle.)

17 MMC (Multi-Media Card) Connection Circuit

The SVT17801 is equipped with a MMC card socket being connected to the S1C17801 with SPI mode as shown in the following diagram.

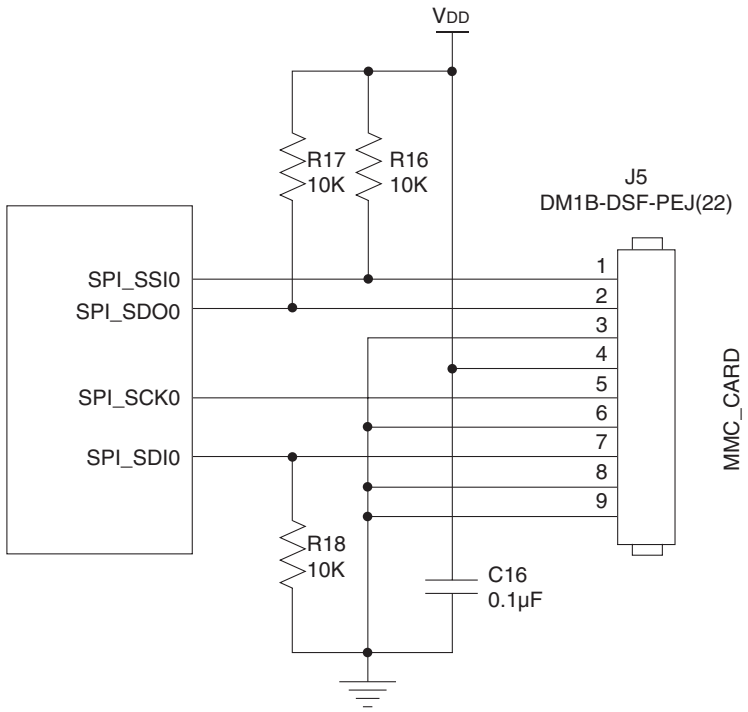


Fig. 17.1 MMC Card Connection Circuit

For information about controlling the MMC card using SPI mode, see the Application Note.

18 USB Connection Circuit

The SVT17801 is equipped with a USB miniB connector being connected to the S1C17801 as shown in the following diagram.

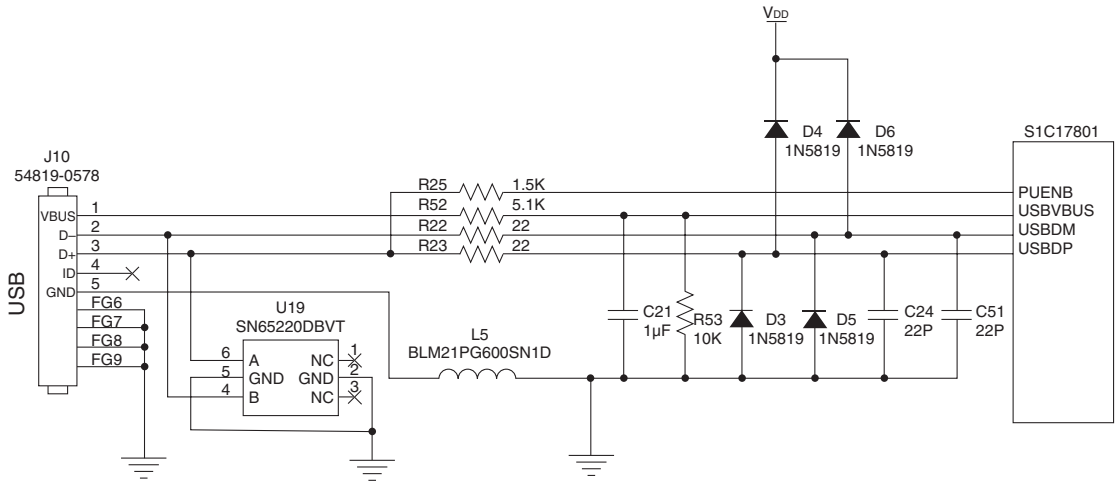


Fig. 18.1 USB Connection Circuit

For information about controlling USB, see the Application Note.

19 Audio Connection Circuit

The SVT17801 is equipped with a 16-bit AudioCodec (TI model PCM3793). SVT17801 circuit related to the AudioCodec is shown in the following diagram.
The SVT17801 connects the S1C17801 and the PCM3793 using I²C and I²S. I²C is used for the communication of audio setup commands issued from the S1C17801 to the PCM3793. Two channels of I²S are available for the S1C17801, i.e., Ch0 (signal name: I2S_*0) and Ch1 (signal name: I2S_***1), used for output and input respectively.**

Switching Audio Master Clock

The SVT17801 can switch the master clock for the PCM3793 between that from I2S_MCLK0 on the S1C17801 and that from an external transmitter. Specifically, either of the master clocks can be selected using a switch IC connected to P32. Following table describes how the switching is possible.

Table 19.1.1 P32 Status and SCKI Connection Status

P32	SCKI (PCM3793) status
H	Connects to SG-8002JC (12.288MHz crystal)
L	Connects to I2S_MCLKO

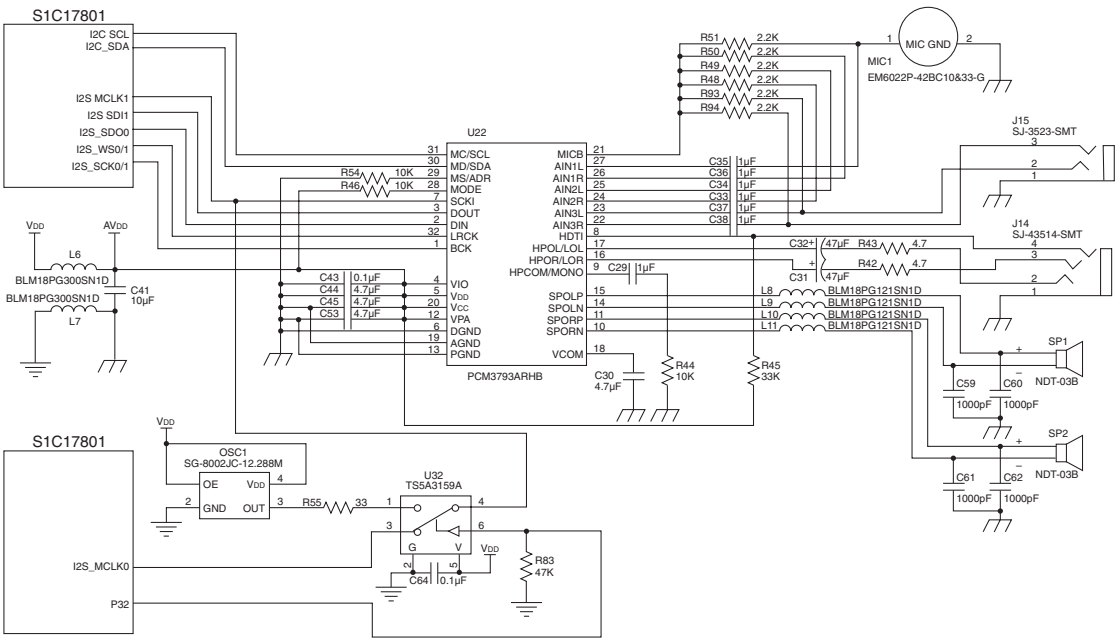


Fig. 19.1.1 AudioCodec IC Connection Circuit

20 Exclusive Control of Ports

The SVT17801 uses five ports exclusively by connecting them to switch ICs as shown in the following. As a result, the following combination cannot be operated simultaneously.

(1) Write to NAND Flash and the control of LCD touch panel.

(2) Write to NAND Flash and the control of power switch using standby.

(3) Write to NAND Flash and the control of 7th pin/9th pin on J8 connector.

Specifically, the five ports are used exclusively by switching H/L of P45 as shown in the following table.

Table 20.1 P45 Status and Connection Status of PC3, PC2, P34, P33, and PA2

P45	PC3	PC2	P34	P33	PA2
H	NAND Flash	NAND Flash	NAND Flash	NAND Flash	NAND Flash
L	J8 connector	Power switch	LCD module	LCD module	J8 connector

Note that the P45 port becomes an input port immediately after reset has been released. In this status, P45 is pulled down to LOW.

The following diagram shows a circuit in this area.

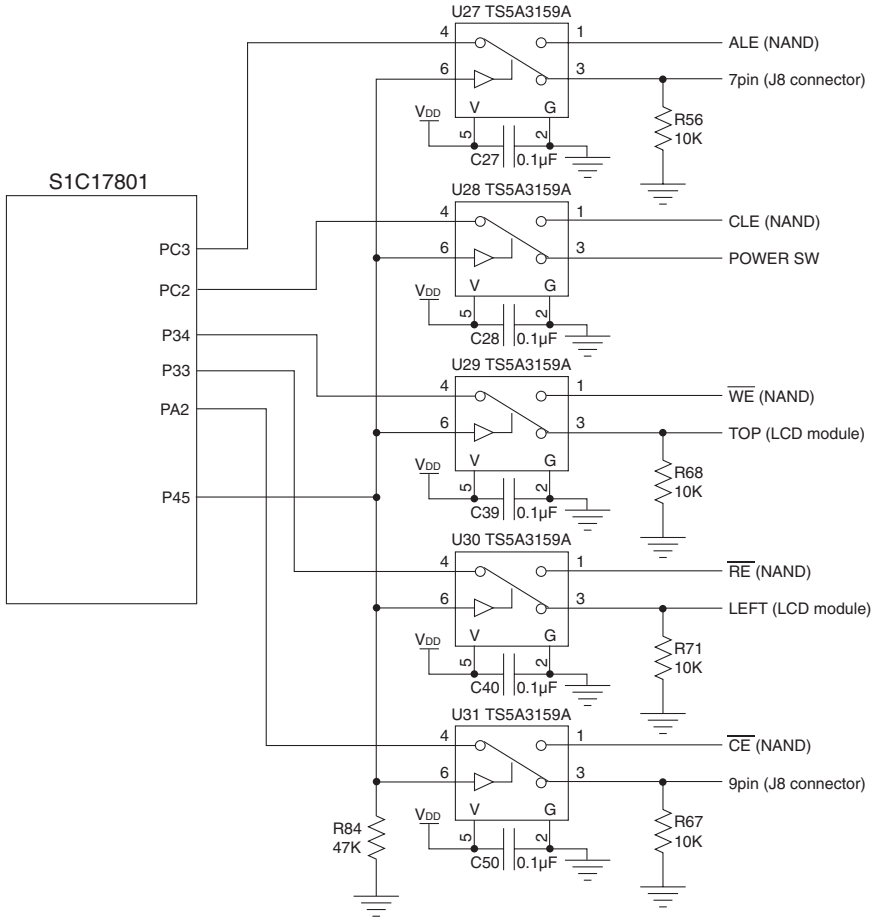


Fig. 20.1 Switch IC Connection Circuit

21 Serial

The S1C17801 has SPI, UART, I²C, and I²S serial ports. Each of the ports is multiplexed with GPIO.

Table 21.1 Serial Port

Mode	Connected to	Multiplex
SPI (ch0)	SD I/F, through holes (TP52,TP53,TP54,TP55)	SPI ⁄ GPIO (P10,P11,P12,P13)
SPI (ch1)	Tri-color LED	SPI ⁄ GPIO (P13,P14,P15,P16)
UART	Expansion I/F (J8), through holes (TP42,TP43,TP44)	UART ⁄ GPIO (P40,P41,P42)
I²C	Expansion I/F (J8), EEPROM, AudioCodec	I²C ⁄ GPIO (P50,P51)
I²S (ch0)	AudioCodec, through holes (TP47,TP48,TP49,TP50,TP51)	SPI ⁄ GPIO (P20,P21,P22,P23)
I²S (ch1)	AudioCodec, through holes (TP47,TP48,TP49,TP50,TP51)	SPI ⁄ GPIO (P24,P25,P26,P27)

22 Specifications For Cpu Board Connectors

The SVT17801 CPU board is equipped with five connectors (No. J6, J7, J8, J12 and J13). J6 can be used for connection to the ICD board, and J7, J8, J12 and J13 for connection with expansion boards. J12 and J13 can be used for connection with the LCD panel attached to the SVT17801.

J6 Connector (to Connect with ICD)

J6 connector is used to connect the ICD board to the CPU board.

* Be careful not to plug this connector reversely. Doing so may damage both of the boards. See figures in the Chapter 3 to check how the CPU board and ICD board are connected. (Face where the USB connector is installed is the surface of the ICD board. Align this surface with the surface of the CPU board.)

Specifications for each connector are as follows:

Table 22.1.1 J6 Connector Pin Assignment

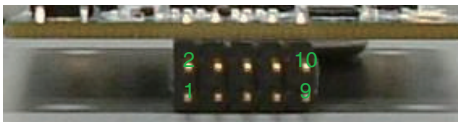
Connector J6

(The right figures show the side view)
Maker: Japan Aviation Electronics Industry,Limited (JAE)
Model number: PS-10SD-D4T1-1 (receptacle)

〈Upper view of CPU board〉

(ICD board side)
Maker: Tyco
Model number: 9-103801-0 (plug)

〈Side view of ICD board〉



No.	Name	I/O	Functionalities
1	DCLK	O	On-chip debugger clock output port
2	GND	–	Power ground (Connection with every pin is recommended.)
3	GND	–	Power ground (Connection with every pin is recommended.)
4	#RESET_OUT	I	Target reset signal input port
5	DSIO	I/O	On-chip debugger clock I/O port
6	TGT_EN	I	Target enable signal input port
7	DST2	O	On-chip debugger status signal output port
8	N.C	–	–
9	Vcc (+3.3V)	–	+3.3V power pin
10	Vcc (+3.3V)	–	+3.3V power pin

J7 Connector

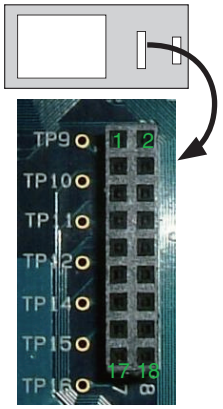
The following shows specifications of J7, a connector for expansion board.

Table 22.2.1 J7 Connector Pin Assignment

Connector J7

Maker: SAMTEC
Model number: SSW-109-01-S-D

〈Front view of CPU board〉



No.	Name	I/O	Functionalities
1	AV_{DD}	–	Analog power pin
2	AV_{DD}	–	Analog power pin
3	P00/AIN0	I / I	General purpose input port / Analog input port
4	N.C (TP9)	–	–
5	P01/AIN1	I / I	General purpose input port / Analog input port
6	N.C (TP10)	–	–
7	P02/AIN2	I / I	General purpose input port / Analog input port
8	N.C (TP11)	–	–
9	P03/AIN3	I / I	General purpose input port / Analog input port
10	N.C (TP12)	–	–
11	P04/AIN4	I / I	General purpose input port / Analog input port
12	GND	–	Analog power ground
13	GND (TP14)	–	Analog power ground
14	GND	–	Analog power ground
15	GND (TP15)	–	Analog power ground
16	GND	–	Analog power ground
17	GND (TP16)	–	Analog power ground
18	GND	–	Analog power ground

J8 Connector

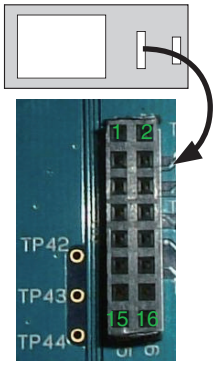
The following shows specifications of J8, a connector for expansion board.

Table 22.3.1 J8 Connector Pin Assignment

Connector J8

Maker: SAMTEC
Model number: SSW-108-01-S-D

〈Front view of CPU board〉



No.	Name	I/O	Functionalities
1	V_{DD}	–	Power pin
2	V_{DD}	–	Power pin
3	P50/I2C_SDA	I/O I I/O	General purpose I/O port I I^2C data I/O pin
4	N.C (TP22)	–	–
5	P51/I2C_SCL	I/O I I/O	General purpose I/O port I I^2C clock I/O pin
6	N.C (TP23)	–	–
7	PC3 (if P45=L)	I/O	General purpose I/O port
8	N.C (TP24)	–	–
9	PA2 (if P45=L)	I/O	General purpose I/O port
10	N.C (TP31)	–	–
11	P40/SIN0 (TP42)	I/O I I	General purpose I/O port I UART data input pin
12	N.C (TP32)	–	–
13	P41/SOUT0 (TP43)	I/O I O	General purpose I/O port I UART data output pin
14	GND	–	–
15	P42/SCLK (TP44)	I/O I I	General purpose I/O port I UART clock input pin
16	GND	–	Power ground

J12 Connector

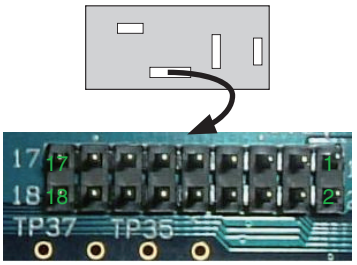
The following shows specifications of J12, a connector for expansion board. This connector is used for the connection with the LCD board.

Table 22.4.1 J12 Connector Pin Assignment

Connector J12

Maker: SAMTEC
Model number: TSW-109-07-S-D

〈Front view of CPU board (without LCD panel)〉



No.	Name	I/O	Functionalities
1	V_{DD}	–	Power pin
2	V_{DD}	–	Power pin
3	PC4/FPDAT4	I/O I O (I/O)	General purpose I/O port I Display data bus
4	PC5/FPDAT5	I/O I O (I/O)	General purpose I/O port I Display data bus
5	PC6/FPDAT6	I/O I O (I/O)	General purpose I/O port I Display data bus
6	PC7/FPDAT7	I/O I O (I/O)	General purpose I/O port I Display data bus
7	P54/FPFRAME	I/O I O	General purpose I/O port I Frame clock
8	P55/FPLINE	I/O I O	General purpose I/O port I Display data line clock
9	P56/FPSHIFT	I/O I O	General purpose I/O port I Display data shift clock
10	P57/FPDRDY	I/O I O	General purpose I/O port I LCD ON/OFF control (L:OFF, H:ON)
11	Backlight control	I	Backlight control (V_{DD} or MFT0 control switch IC)
12	V_{DD}	–	Power pin
13	V_{DD}	–	Power pin
14	V_{DD}	–	Power pin
15	V_{DD}	–	Power pin
16	V_{DD}	–	Power pin
17	GND	–	Power ground
18	GND	–	Power ground

J13 Connector

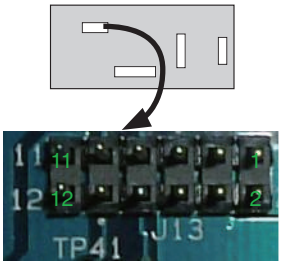
The following shows specifications of J13, a connector for expansion board. This connector is used for the connection with the LCD board.

Table 22.5.1 J13 Connector Pin Assignment

Connector J13

Maker: SAMTEC
Model number: TSW-106-07-S-D

〈Front view of CPU board (without LCD panel)〉



No.	Name	I/O	Functionalities
1	V_{DD}	–	Power pin
2	V_{DD}	–	Power pin
3	P33 (if P45=L)	I/O	General purpose I/O port
4	P34 (if P45=L)	I/O	General purpose I/O port
5	P05/AIN5	I/O I I	General purpose I/O port I Analog input port
6	P06/AIN6	I/O I I	General purpose I/O port I Analog input port
7	N.C	–	–
8	N.C	–	–
9	N.C	–	–
10	N.C	–	–
11	GND	–	Power ground
12	GND	–	Power ground

J18 Connector

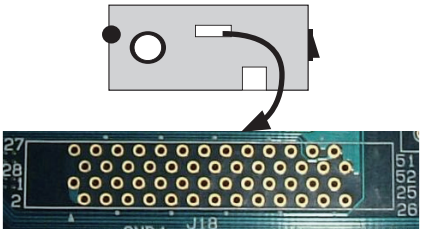
The following shows specifications of J18, a connector for expansion board. This connector can be used for connection with external bus and others. (The connector is not installed.)

Table 22.6.1 J18 Connector Pin Assignment

Connector J18

Maker: HIROSE
Model number: FX2C-52P-1.27DSA(71)

〈Rear view of CPU board〉



No.	Name	I/O	Functionalities	No.	Name	I/O	Functionalities
1	(+5V)	–	–	27	A7/P67	O I I/O	External address bus I General purpose I/O port
2	(+5V)	–	–	28	A8/P70		
3	D0/P90	I/O I I/O	External data bus I General purpose I/O port	29	A9/P71		
4	D1/P91			30	A10/P72		
5	D2/P92			31	A11/P73		
6	D3/P93			32	A12/P74		
7	D4/P94			33	A13/P75		
8	D5/P95			34	A14/P76		
9	D6/P96			35	A15/P77		
10	D7/P97			36	A16/P80		
11	D8/PB0			37	A17/P81		
12	D9/PB1			38	A18/P82		
13	D10/PB2			39	A19/P83		
14	D11/PB3			40	A20/P84		
15	D12/PB4			41	A21/P85		
16	D13/PB5			42	A22/P86		
17	D14/PB6			43	N.C (TP26)	–	–
18	D15/PB7			44	$\overline{RD}$ /PA4	O I I/O	Memory controller I General purpose I/O port
19	N.C (TP25)	–	–	45	$\overline{WRL}$ /PA5		
20	A0/P60	O I I/O	External address bus I General purpose I/O port	46	$\overline{BSH}$ /PA6		
21	A1/P61			47	$\overline{BSL}$ /P60		
22	A2/P62			48	P44	I/O	General purpose I/O port
23	A3/P63			49	$\overline{RESET}$	I	Reset signal
24	A4/P64			50	N.C (TP27)	–	–
25	A5/P65			51	(GND)	–	–
26	A6/P66			52	(GND)	–	–

Appendix A How to Measure Current Consumption

For measuring current consumption of the single S1C17801 unit, jumpers (JP4,JP5,JP2) are available on the SVT17801 CPU board. The S1C17801 has three power supplies, one for core and I/O (V_{DD}), one for analog system (AV_{DD}), and the other for RTC ($RTCV_{DD}$). Jumpers are available for each power supply. Current consumed by each power supply line can be measured by inserting an ammeter among the pins after removing the jumper. Sum of the current obtained from each power line is current consumed by the single S1C17801 unit.

A.1 Measuring V_{DD} Current Consumption

Current consumed by the power supply for core and I/O (V_{DD}) can be measured by inserting an ammeter into JP4. Because external components affect the measurement, some necessary process is required for each I/O pin. To measure current consumption for the single S1C17801 as described in the S1C17801 Technical Manual, influence by current must be controlled for "USB pins" and "STBY pins."
For information about sample software (software flow) to measure current consumption, see the S1C17801 Current Consumption Measurement Application Note.

* USB Pins

  Shot key diodes D3 to D6 are attached to the SVT17801 USB pins as shown in the figure A.1. The diodes attachment is intended for electrostatic protection. However, current flowing through the diodes is also measured when measuring Halt or Sleep current of the single S1C17801, and this diodes current causes deviation of the single S1C17801 current consumption from that described in the S1C17801 Technical Manual.

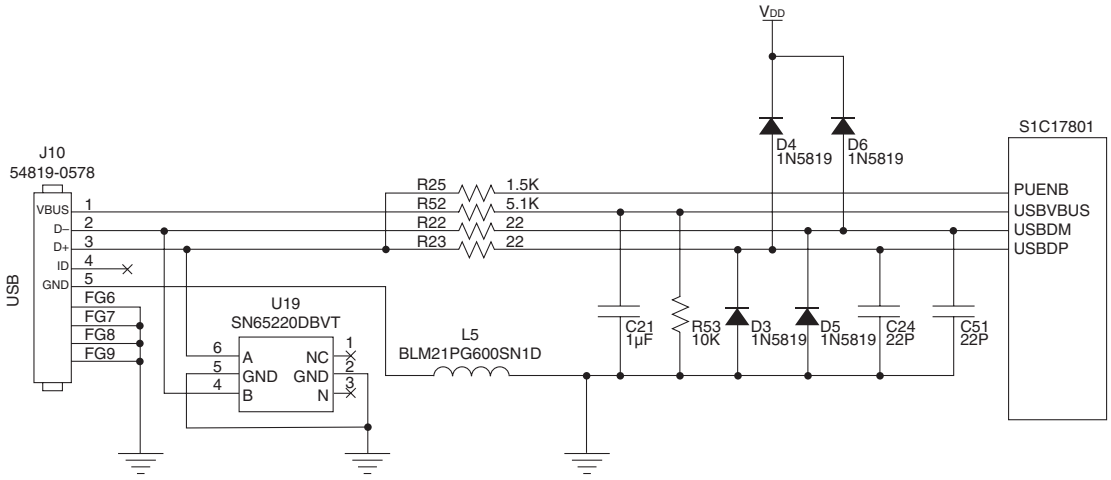


Fig. A.1 USB Connection Circuit

If each USB pin is in the following state,

- as shown in the figure A.1.,
- N.C. for each of the USB pins (D3 to D6, C51,C24,R53,C21,R25,R52,R22,R23 not installed)

Current consumption differential for V_{DD} line is approximately 100 µA.

* STBY Pins

  The STBY pin on the SVT17801 can be controlled by GPIO(P43) as shown in the figure A.2, and pulled down by the resistor R21 (10KΩ). The following current flows if P43 is in HIGH output state.

  IR21 = 3.3(V) / 10(kΩ) = 330(µA) (if V_{DD} = 3.3V)

To reduce current consumption in Halt or Sleep mode, set P43 to the LOW output port. Then this current is cancelled. However, note that executing this operation while OSCI is used as a system clock causes system to halt

until being reset.
When this circuit is actually used for your circuit, a proper pull-down resistance value must be selected because the value affects the current consumption of total system.
(When R21 = 100KΩ IR21= 33 μA approx., and when R21 = 500KΩ R21 = 6.6 μA approx.)
If you do not use battery backup function, input RTCVDD to #STBY.

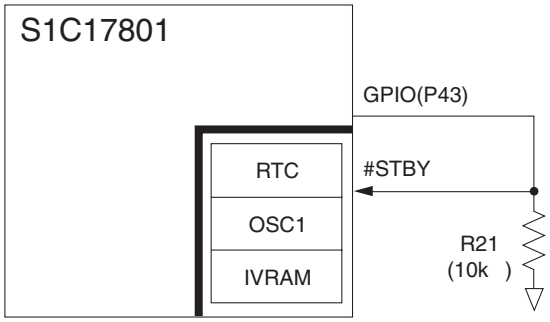


Fig. A.2 #STBY Related Circuit

A.2 Measuring AVDD Current Consumption

Current consumed by the power supply for ADC (AVDD) can be measured by inserting an ammeter into JP5.
Note that sample software (software flow) for measuring the current consumption, the software referred in the S1C17801 Current Consumption Measurement Application Note does not control the AVDD line.

A.3 Measuring RTCVDD Current Consumption

Current consumed by the power supply for IVRAM and RTC inside battery backup area (RTCVDD) can be measured by inserting an ammeter into JP2.
When JP2 is measured between 2-3 pins, the voltage becomes 3.3V because RTCVDD is supplied from VDD generated by regulator. When JP2 is measured between 1-2 pins, on the other hand, the voltage becomes 3.0V because RTCVDD is supplied from coin cell battery.
Note that sample software (software flow) for measuring the current consumption, the software referred in the S1C17801 Current Consumption Measurement Application Note causes approximately 3 to 4 μA current to flow in the RTCVDD line.

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S5U1C17801T1100 Hardware Manual
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Document code: 411524500
First issue July, 2008
Printed in Japan ⓗA